

THE EFFECTS OF RIME BASED INSTRUCTION ON ADOLESCENT
STRUGGLING READERS: THE IMPACT OF COLOR-CODED VOWELS

By

Caroline A. Mark
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Dissertation Committee:

Chairperson, Donald D. Deshler

Bruce Frey

Hugh Catts

Neal Kingston

Blake Hansen

Dissertation defended: _____

ACCEPTANCE PAGE:

The Dissertation Committee for Caroline Mark certifies
that this is the approved version of the following dissertation:

THE EFFECTS OF RIME BASED INSTRUCTION ON ADOLESCENT
STRUGGLING READERS: THE IMPACT OF COLOR-CODED VOWELS

Chairperson, Donald D. Deshler

Date Approved

Abstract

Efficient word reading skills are required by secondary students to comprehend academic texts. Adolescents who continue to struggle with basic word reading experience decreased academic success and decreased motivation for reading. The purpose of this study was to investigate the effects of a color-coded rime intervention (Sound Effects) on adolescents with word reading disabilities. An initial single-case design study was conducted with three high school students to investigate the significance of Sound Effect's use of color for supporting accurate vowel pronunciations. The color-cued rime condition resulted in increased accuracy of vowel pronunciations when compared to the baseline and uncolored rime conditions. A second study used a comparison group design with 47 middle school students in grades 5-8. Participants were assigned to one of three conditions: Sound Effects, Corrective Reading, or a no-treatment control group. After 15 tutoring sessions neither of the intervention groups exhibited statistically significant gains on word reading variables, though both Sound Effects and Corrective significantly improved students' spelling. Results from a measure of reading self-concept indicated that students in the Corrective intervention experienced decreased reading attitude from pre- to post-testing. A measure of social acceptability indicated that Sound Effect was perceived as acceptable to the participants.

DEDICATION

To Steve and Rich:

The work that I have chosen to do has always been a direct reflection of the impact that you two have had on my life. I hated watching you both acquire bumps and bruises during your school years, but I am in awe of the very kind and resilient people that you have become. I am *so* proud to be your sister.

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CHAPTER I

INTRODUCTION

The ability to read printed words is a prerequisite to comprehending what is read. While oral language comprehension skills account for more variance in reading comprehension in the later school years (Catts, Hogan, & Adlof, 2005), quickly recognizing individual words continues to act as a gatekeeper to accessing and understanding print (Hoover & Gough, 1990). Older students with significant word reading difficulties display marked deficits across other literacy skills including: spelling (Bhattacharya, 2006), vocabulary (Hock, et al., 2009), and writing performance (Juel, 1988).

Developing the necessary word recognition skills to cope with the demands of secondary content is no easy feat. Anderson and Nagy (1992) have estimated that there are at least 180,000 words used across school-aged texts, but this estimate does not account for all of the content-specific words required by secondary education (Anderson, 1996). In order to comprehend more meaning-laden content reading passages, middle and high school students must have mastery over a considerable bank of functional words (Gough, 1983). In order to acquire this many words during their school years, students will need to be able to independently decode words (Share, 1995). Some research suggests that after only a few experiences successfully decoding a word, it becomes more easily recognizable (Share, 1999, 2004).

The ability to instantly recognize a word and read it effortlessly has been called *sight word reading*. It is a critical precursor to fluent word reading and, ultimately, reading comprehension (Ehri, 1998). Evidence from Stroop measures, which assess

reaction time (e.g., individuals take longer to identify the color of the printed word *green* when it is printed in red ink), has suggested that sight word readers are able to recognize words automatically even when they are trying to ignore them (Ehri, 1998). Research has also indicated that while readers retrieve the pronunciations of sight words, they also retrieve information about the word's meaning (Ehri & Rosenthal, 2007). Sight word recognition plays an especially important role as students begin reading advanced texts. Without a facility for word reading, students cannot analyze the complex language structures embedded in text because they are focused on word reading. When cognitive resources are used for word identification, there are fewer resources available for comprehending text (Perfetti, 2007; Perfetti & Lesgold, 1977).

At the root of significant difficulties with word reading are deeply entrenched language processing problems (Morris, et al., 1998; Shankweiler & Liberman, 1972). Unfortunately, research has suggested that individuals who struggle to process the sound structure of language do not out-grow this deficit (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996; Shaywitz, et al., 1999). The emotional impact of poor reading skills is particularly troubling (Daniel, et al., 2006). Adolescents with stagnant word reading difficulties read less than their peers (Cunningham & Stanovich, 1997), are less persistent in the face of challenging texts (Butkowsky & Willows, 1980), may be held back several grade levels (Neild & Balfanz, 2006), and are more likely to exhibit self-destructive behavior (Daniel, et al., 2006).

Research related to the skills of older struggling readers with unaddressed deficits suggests that they struggle to make use of phonological information. In fact, alphabetic skills often remain underdeveloped among older readers until they receive intensive

intervention (Torgesen, Rashotte, Alexander, Alexander, & MacPhee, 2003). In a study comparing adults with reading disabilities to normally-developing children, researchers found that the children were better able than the adults to use sound-symbol information across the reading tasks (Greenberg, Ehri, & Perin, 2002). Adults with reading disabilities had learned to rely on the appearance of words, because they had never acquired the ability to self-teach word reading through decoding. Their performance in this study suggests that older struggling readers possess partial alphabetic skills, which makes reading words akin to a guessing game.

Older students with reading disabilities also exhibit difficulties with spelling. Constructing words according to an agreed upon system of combining letters is extraordinarily challenging for individuals with poor word reading skills (Moats, 1996; Shaywitz, et al., 1999). Though word reading and spelling are closely related and rely on the same knowledge sources, spelling is more difficult to execute than word reading because it requires the student to correctly represent and sequence all sounds in a word (Ehri, 2000). Even if individuals with significant reading problems improve their word recognition skills and are able to interact with complex text, often their spelling ability remains significantly impaired compared to their peers (Bruck, 1993; Greenberg, et al., 2002).

Moats (1996) analyzed the spellings of 19 adolescent males with reading difficulties. The participants were all attending a private school for students with reading disabilities and had received intensive remedial instruction. Despite their exposure to high-quality interventions, these students continued to demonstrate significant difficulties with spelling. Spelling errors for these older readers revealed faulty phonologic

processing that may be particularly resistant to treatment.

Some research identifies vowels as being problematic for older readers (Bertucci, Hook, Haynes, Macaruso, & Bickley, 2003). Bertucci et al. found that adolescents with reading disabilities experienced difficulties differentiating between and producing closely articulated vowel sounds (e.g., /ɪ/, /ɛ/, /æ/)¹. Their findings suggest that students with reading disability exhibit a lacking awareness of the underlying sound structure of spoken vowels and, as a result, experience difficulty mapping these sounds onto print.

Challenges with spelling and reading multisyllabic words may also reveal underlying difficulties with vowels (Bhattacharya, 2006). Every syllable has a nucleus vowel, but research of adolescents with reading disabilities suggests that these students are unable to represent all vowels in their spellings of multisyllabic words. Likewise, they experience difficulty in making use of vowels when reading multisyllabic words (Bhattacharya & Ehri, 2004).

Empirical evidence suggests that adolescents can be taught reading and spelling skills during middle and high school (Abbott & Berninger, 1999; Calhoon, 2005; Calhoon, Sandow, & Hunter, 2010; Lovett, et al., 1994; Lovett & Steinbach, 1997; Lovett, Steinbach, & Frijters, 2000). The interventions that have improved adolescents' performance on these skills have focused primarily on teaching basic phonemes or rimes but have not necessarily focused on vowels in particular. More recent evidence suggests; however, that facility with vowels is more impactful than other phonemes to later reading success (Savage & Stuart, 2006).

Though some progress has been made in regards to improving adolescents'

¹ For more information about the production of these vowel sounds see this website:
<http://www.uiowa.edu/~acadtech/phonetics/>.

reading and spelling, this research has neglected to evaluate student motivation (Quirk & Schwanenflugel, 2004). Students of all reading abilities exhibit less interest in reading as they enter adolescence (McKenna, Kear, & Ellsworth, 1995). Struggling adolescent readers who have endured repeated failures are at particular risk. They are less likely to persist in the face of difficult reading tasks and are less likely to believe themselves capable of acquiring reading skills in the future (Butkowsky & Willows, 1980; Nicholls, 1979). Research on adolescent readers must consider variables related to motivation and students' satisfaction with instructional methods in order to produce socially significant solutions to decreased interest in reading (The Partnership for Reading, 2002).

Attempts to address the needs of secondary students who continue to find word reading laborious have been met with varied results (Biancarosa & Snow, 2006). Some have argued that adolescents require intensive remediation of basic language processing, resulting in pullouts during the school day in intervals lasting as long as two hours (Moats, 2004). These intensive programs typically focus on teaching basic sound-symbol correspondences and single-syllable decoding (Archer, Gleason, & Vachon, 2003). Others have suggested that interventions addressing basic sound-symbol correspondences are necessary for a very small segment of the adolescent struggling reader population, and fluency training is seen as the most urgent instructional need (Buly & Valencia, 2003). Still others have argued against word-level instruction altogether (i.e., alphabets and fluency), alleging that this type of instruction will result in further disengaged students (Ivey & Baker, 2004). Finally, though there has been much discussion about motivation among struggling adolescent readers (Wigfield, 2004), there is little indication that remedial programs have explicitly evaluated their instructional approaches with

regard to motivational outcomes (Quirk & Schwanenflugel, 2004).

The primary purpose of this study was to examine the effects of Sound Effects² (Dittmer, 2011), a basic reading intervention (referred to throughout as a *subsyllabic intervention*) on adolescent reading and spelling skills. Sound Effects focuses on supporting adolescent struggling readers with medial vowel identification using rime units and is structured to provide basic decoding skills without decreasing students' motivation for reading. Prior to describing the primary comparison group study, chapter two will present findings from a single-case study, which used a multiple-baseline design to examine the importance of using color to support vowel identification in the Sound Effects intervention. The next chapter will review the literature related to subsyllabic instruction for adolescents. Within chapter four the design of the primary study will be presented. Sound Effects was evaluated in contrast to a widely used reading program (Corrective Reading, Engelmann, et al., 2008a), and a no-treatment control group. Corrective Reading teaches students to read individual phonemes and uses a Direct Instruction approach to teach decoding skills (Stein, Carnine, & Dixon, 1998). Given the serious consequences of decreased reading motivation and attitudes among secondary students, this study will carefully consider these outcomes. Chapter five will present results related to reading, spelling, reading self-concept and students' satisfaction with their assigned intervention. Finally, chapter six will review conclusions related to both the single-case study and the primary comparison group study.

² Sound Effects uses color cues to support struggling readers as they retrieve and produce vowel sounds. Color-coded playing cards as well as a color-wheel game board are key elements of this instructional approach. Because this scaffold is central to the intervention, the utility of color for supporting the correct identification of vowel sounds was examined prior to conducting the primary comparison group design study.

CHAPTER II

SINGLE-CASE STUDY

The importance of color as a cue to vowel pronunciation is presumed to be a key element of Sound Effects and a feature unlike the scaffolds provided in other basic decoding programs (see Figures 3 and 4, p. 47-48). In order to assess the importance of color within this instructional approach, an initial study was conducted. A multiple-baseline design was used to systematically investigate the following question: Does color support provide struggling adolescent readers with a meaningful cue to vowel pronunciations and, therefore, more accurate practice?

Literature Review

Individuals with significant word reading difficulties often exhibit deeply entrenched phonological deficits, which may prevent them from developing the ability to quickly access pronunciations of individual words (Ehri & Rosenthal, 2007). Historically there have been many varied efforts to make segments of words more explicit to struggling readers. Perhaps most famously, Samuel Orton argued that multisensory instruction was necessary because of a lack of hemispheric brain organization among struggling word readers. These students, he argued, required the use of multisensory techniques, such as pairing alphabetic instruction with hand movements:

Since, moreover, in the greater number of strephosympholias there is no frank disorder in the kinaesthetic function, we have made use of movement patterns to aid in eradicating confusions between twin letters and in maintaining consistent dextrad progress in assembling the units of the word. (Orton, 1937, p. 159)

Orton argued that word reading instruction should be paired with another modality (visual, auditory, or kinesthetic) in order to support brain function across both hemispheres. Research on reading disability has not supported Orton's original notion of word reading disability as being equivalent to "word blindness," but his ideas about reading instruction have remained influential (Ritchey & Goeke, 2006; Sheffield, 1991).

At present, reading disability is understood to be a language-based disorder and individuals with reading disability tend to experience difficulties with verbal memory, phonological awareness, and rapid naming (Vellutino, Fletcher, Snowling, & Scanlon, 2004). More recent literature on memory devices, or mnemonics, has indicated that pairing such a device with reading instruction may support the encoding and retrieval of language related information (Wolgemuth, Cobb, & Alwell, 2008). Hulme (1981) suspected that this was the case with the success of Orton's multisensory approaches. Multisensory approaches may have proven helpful, Hulme reasoned, not because of neurological integration, but because multisensory techniques function as a memory device when paired with reading instruction.

Memory devices have taken many different forms over the years, including peg words, sentences, or visual cues (Wolgemuth, et al., 2008). In the case of the Sound Effects intervention, color is paired with specific vowel sounds to provide an additional pronunciation cue. Because vowel sounds and their alphabetic representations are particularly challenging to readers of English (Treiman, Mullennix, Bijeljac-Babic, & Richmond-Welty, 1995), additional scaffolds or supported instruction may provide for more meaningful practice opportunities (Rupley, Blair, & Nichols, 2009).

Hines (2009) attempted to make early rime-reading instruction more meaningful by adding color coding to lessons for four first grade students who had been identified as at-risk for reading failure. Students received one-on-one instruction in a book series, which highlighted specific rime patterns. Students were taught *short a* vowel patterns and *short e* vowel patterns. *Short a* rimes were color-coded with different shades of blue, while *short e* rimes were color-coded with different shades of red. Instruction length varied considerably from student to student (two and a half to eight hours). Three dependent uncolored word-reading measures evaluated student learning in the intervention. The first measure consisted of words that were taken directly from the stories read during the intervention. A second measure evaluated student's ability to read uninstructed words that contained taught rime patterns. A third and final measure assessed the participant's ability to read *short a* and *short e* words in rime patterns which had not been taught during the intervention.

Results indicated that the students were most successful reading words that had been directly taught during the intervention (students averaged a 73% increase over baseline). The findings for generalization of rime instruction were somewhat lower. The students improved an average of 56% over baseline for the second measure, which evaluated their transfer of known rimes to unknown words. On the final measure, new rime patterns with the same vowel sounds; students improved an average of 29% over baseline. These findings suggest that color may provide a useful cue to students as they attempt to acquire word-reading skills; although, this study did not systematically evaluate non-color-cued instruction as compared to the color-cued rimes. Because the

study was conducted with first grade students, it is also not clear if using color to make vowel sounds more explicit is applicable to older students.

The purpose of this initial study was to assess the use of color cuing in the Sound Effects intervention. This investigation was designed to extend the work of Hines (2009) to older students with significant reading difficulties. It was suspected that color-coding of vowel sounds provides a meaningful scaffold for older students and aids in the retrieval of vowel pronunciations. In a previous ABAB design study (Mark, 2009), a middle school student with a reading disability reduced rime reading errors and increased speeded rime naming after the introduction of color-cued rimes. This current study was an attempt to evaluate color cues through a more rigorous research design.

Methods

Participants were three male students from a rural Midwestern high school (pseudonyms Greg, Joseph, and Adam). All were served by the school's special education program. Greg was identified as having a mild cognitive disability, Adam was identified as having a learning disability, and Joseph was receiving services under the label of communication disability. Greg, 18 years old, was a senior; whereas, Joseph and Adam were both 15 year-old freshman. All three students were participating in general education classes (with the exception of a modified English course) and had not been receiving any word reading instruction during the Fall 2010 semester.

The participants were identified using the following procedure. Two special education teachers selected a group of high school students whom they considered to have the most profound word recognition difficulties. The pool of identified students was then screened for participation using a rime reading measure (described below). The

three lowest performing students on the rime reading measure were selected for participation in this study. Students' parents signed consent forms to approve of their son's participation. Participants individually came to a quiet office within the school and were assessed twice daily for three weeks during their first period class and again at the end of the school day.

Dependent measure. The study's dependent measure consisted of visual stimuli displayed on presentation software (i.e. PointPoint®). Each presentation contained one hundred slides; every slide displayed an image of a color-coded rime card from the Sound Effects intervention (see Appendix G). The image was centered on a black background. The assessment was administered from a laptop computer and students were directed to read as many slides as they were able to in one minute. Participants could advance the slides at their own pace using the computer's keyboard. Each administration session was audio recorded for later scoring. Rime reading accuracy was calculated by dividing the total number of rimes read correctly by the total number of rimes attempted. Rime reading accuracy was chosen as the dependent measure as it reflected overall increases in correct identification rather than increases in speeded rime reading alone. In addition, accuracy, not speed, was considered more important achievement for the student participants.

Design and phases. A multiple-baseline design across subjects was used to determine the differential effects of color-coding rime units on rime reading accuracy. The study contained three phases: baseline, practice with no color-coding, and practice with color-coding.

During the baseline phase the students were provided with no instruction. They were asked to complete the rime card assessment for one minute. The meaning of color-coding was not explained to the students.

In the second phase, students engaged in a single learning activity before completing the rime card assessment. Onset and rime cards with no color were used as playing cards. The cards were identical to those used in Sound Effects, except that they were not color-coded. The instructional activity, a spin-off of the traditional card game *War*, allowed students to blend 30 rime cards with 30 onset cards. For the blending procedure, students read the rime card (e.g., *-ate*) and then blended it with *r-* to make the word *rate*. To play War, the student and instructor are each dealt 30 rime cards. Both read their cards using the blending procedure previously described. If one player makes a real word, while the other plays forms a non-word, the first player takes the played cards. If both players form a real word the players continue to lay cards until one player creates a real word. If at any point during instruction the student read a card incorrectly they were immediately provided with the correct pronunciation and asked to repeat the correct pronunciation out loud. After the student blended 30 rime cards with initial consonants, the rime card assessment was administered. Again, the meaning of the color-coding on the assessment was not explained to the students.

For the final phase students engaged in the same learning activity described above, although during phase three the students completed the instructional activity with color-coded cards and the meaning of the color *was* explained to the students. If a participant read a card incorrectly they were provided with the correct pronunciation and

reminded of the color's sound (e.g., "Remember, red says the sound A."). After playing War with the color-coded cards, students completed the rime card assessment.

Interrater agreement. Two scorers checked all data points within all phases in order to ensure the reliability of students' scores. Percentage of agreement was calculated by dividing the lower accuracy score recorded from one observer by the higher accuracy score from the second observer and multiplying by 100%. This resulted in an overall agreement of 93% across conditions and subjects.

Results

This study was designed to assess the effect of using color to cue three high school students with significant word reading difficulties to read rimes correctly.

Table 1 provides specific data, organized by student, on the number of rimes read and the number of errors across each of the three phases.

Table 1

Rime Reading by Phase

Student	Rimes Read Correctly	Errors	Accuracy (%)	Change from Baseline (%)	
Greg	Baseline	15	9.2	62	---
	No-color	14.6	6.9	68	6
	Color-cue	17.4	4.5	81	19
Joseph	Baseline	18	17.4	51	---
	No-color	20.8	19.8	51	0
	Color-cue	17.5	3.5	83	32
Adam	Baseline	20.6	13.5	61	---
	No-color	26.4	10.8	71	10
	Color-cue	16.2	5.8	74	13

As the percentage of change in rime cards read correctly in Table 1 indicates, the color-cueing condition resulted in improved rime reading accuracy over the baseline condition and uncolored rime card instruction.

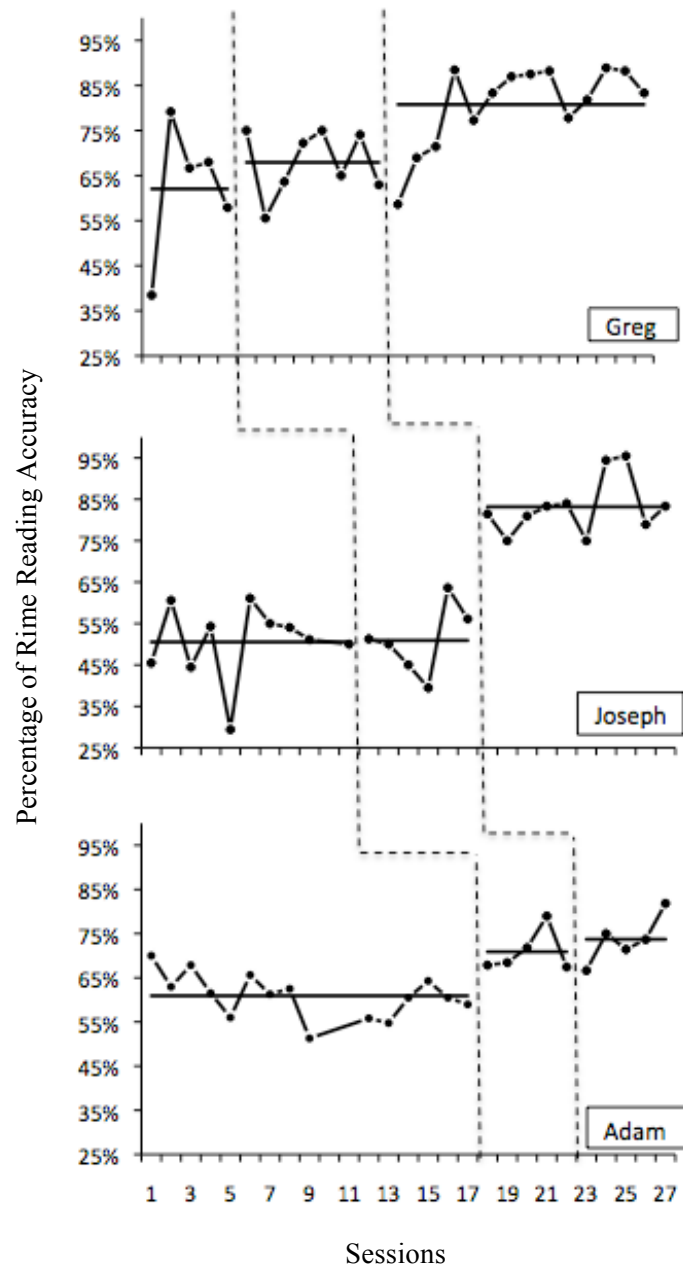
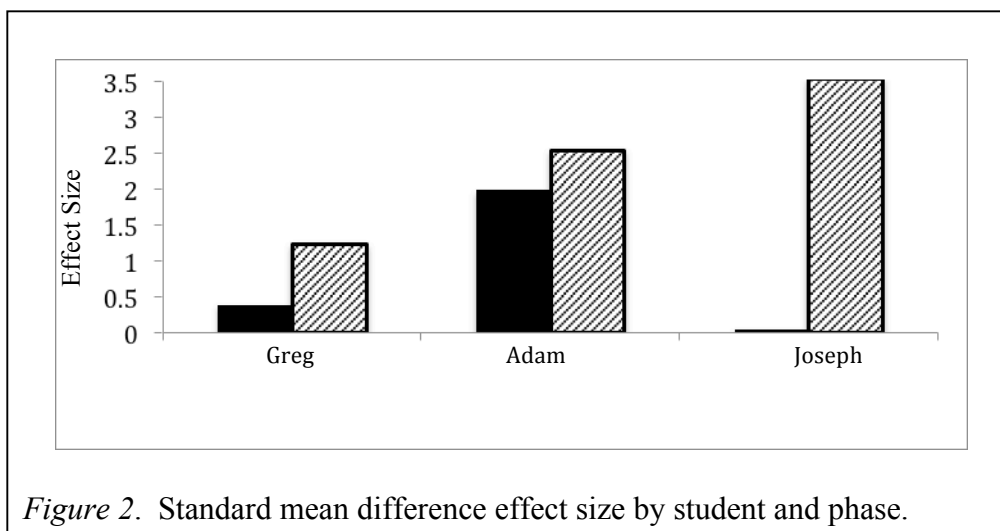


Figure 1. Results by student.

Figure 1 displays the participants' performance over each phase. Practice with uncolored rime cards did increase the rime reading accuracy of both Greg and Adam. Greg improved his accuracy 6% from baseline, while Adam improved 10% from baseline after practicing with the uncolored rime cards. Both of these students started with greater accuracy than Joseph, whose baseline performance averaged around 51% accuracy on rime reading, roughly 10% lower than Adam and Greg. Joseph experienced the largest gains over baseline during the color-cued phase, increasing accuracy 32%, compared to Greg (19% improvement) and Adam (13% improvement). It is worth noting that the color-cuing condition slowed the participant's responses. Joseph and Adam notably decreased the number of rimes that they read during the color-cued condition.

Though there is no ideal effect size calculation for single subject designs (Kratochwill, et al., 2010), the standard mean difference (SMD) was estimated for both the non-colored and color-cued phases for each participant. This effect is calculated by determining the difference between the mean baseline score and the mean intervention score, and then dividing the sum by the standard deviation of the baseline data (Olive & Smith, 2005). The SMD calculation produces an effect size value, unlike other proposed methods for determining the effect of a single-case design intervention (e.g., percentage of non-overlapping data), as it produces an actual effect size value (Cohen's *d*). Results for the effect size calculations across phases and participants are reported below in Figure 2.



The no-color instructional phase resulted in a range of effect sizes. For Joseph, the no-color phase produced no notable effect, whereas for Greg and Adam effect sizes ranged from moderate ($d = .39$) to large ($d = 1.98$). The color-cued phase, however, resulted in large effect sizes for all of the students ranging from 1.23 (Greg) to 3.53 (Joseph).

These findings suggest that color-coding rimes provided the participants with a useful cue for identifying the vowel sounds. Though practice opportunities reading the uncolored rime cards resulted in some modest improvements for two students, the color support improved all students' correct identification of rime units and vowel pronunciations over and above the increases achieved by practice without the color cue. Given that the color support associated with the Sound Effects intervention was found to enhance students' identification of vowels, the next study will use a comparison group design to compare Sound Effects to another widely-used basic reading program and a no-treatment control group.

CHAPTER III

LITERATURE REVIEW

Learning to efficiently read words necessitates alphabetic skills (Ehri, 1998). Unfortunately for many, acquiring facility with basic decoding skills is not an easy task. The English alphabetic system has 26 symbols that mimic speech sounds. Individual letters give the impression that are natural divisions within words that can be easily detected, but foundational research in reading indicates that this is not the case (Shankweiler & Liberman, 1972). Instead the process of segmenting words into smaller sounds can be considered an artificial task. This is because the sounds in spoken words are co-articulated with no discernable divisions. In order to learn to segment words into sounds, the reader must begin by practicing with individual letters and sounds, before rapidly reading whole words (Ehri, 2005; Stahl & Murray, 1998).

According to some estimates, roughly 20% of all individuals will struggle learning to read (Shaywitz, 1996). Because reading acquisition is not a natural process, difficulties with basic word reading, spelling, and fluency will persist as long as these skills are not addressed through intensive instruction (Juel, 1988; Shaywitz, et al., 1999). Correspondingly, there is no developmental window during which basic word reading skills must be taught (Francis, et al., 1996). This may seem to suggest that basic alphabetic and word reading instruction for children and adolescents could be designed similarly; however, there are critical differences which impact how alphabetic instruction for adolescents should be structured.

In order to better conceptualize how to provide basic word reading instruction to adolescents, the following literature review is divided into four areas: (a) models of word

reading acquisition, (b) subsyllabic units for instruction (phonemes and rimes), (c) subsyllabic instruction for adolescents, and (d) reading motivation and attitude. Before reviewing reading research specific to adolescents, a well-accepted theory of word reading acquisition will be compared to a recent word acquisition model. The more contemporary model of word reading centralizes the role of vowels, therefore the complexity of representing vowel sounds will be briefly considered. Next, basic definitions for traditional word reading instruction using phonemes and rimes will be discussed. The following section will review the literature related to alphabetic interventions for adolescents. Finally, developmental shifts in adolescent motivation and attitude will be considered.

Models of Word Reading Acquisition

Unlike oral language reading, which develops with maturation through a series of fairly predictable stages, reading does not usually develop in the absence of instruction (Gough, 1993; Masonheimer, Drum, & Ehri, 1984; Share, 1999). Individuals learning to read words using alphabetic skills, including older students, will often exhibit similar kinds of behaviors as they become more skilled at instant sight word recognition. Ehri's *Phases of Sight Word Reading* represents the progression of skill acquisition in alphabetic word reading. A more recent theory, the *Developmental Model of Reading Acquisition*, by Savage and Stuart suggests that learning to read words is made particularly challenging by medial vowels. Though all medial position letters are more difficult for readers to represent accurately, vowels are particularly challenging because of their highly variable representations in spelling.

Phases of sight word reading. Ehri (1998) has proposed that word reading

acquisition in an alphabetic language such as English, is composed of several phases prior to sight word reading development including (a) Pre-Alphabetic, (b) Partial-Alphabetic, (c) Full Alphabetic, and (d) Consolidated. Central to Ehri's Phases of Sight Word Reading is knowledge about how sounds correspond to single letters or letter combinations (i.e., grapheme-phoneme knowledge). The Pre-alphabetic phase is characterized by children recognizing words on the basis of visual cues rather than grapheme-phoneme knowledge. Because they do not possess a working understanding of how letters represent speech sounds, this phase is sometimes called visual cue reading (Ehri, 2005). In a second phase, the Partial-alphabetic phase, individuals do not have complete knowledge of all phonemes and corresponding graphemes. As a result, their ability to recognize words is made on the basis of their knowledge of some letter sounds, but they are not able to fully segment a word into its individual phonemes (Ehri & Wilce, 1987). In the Full alphabetic phase, readers can now fully decode words and, as a result, printed words are represented more accurately in memory. As readers decode words repeatedly, they are able to begin to read words as sight words, rapidly processing the word with increasingly less cognitive effort (Perfetti & Lesgold, 1977). Ehri and McCormick (1998) have suggested that the full alphabetic phase represents a significant turning point for the student. Having a full understanding of letter and sound correspondences enables the student to begin processing novel words in a way that resembles more mature readers. Though at the beginning of this phase word reading is an arduous task for students, they become rapidly more adept at decoding words by the end of this phase. In the Consolidated phase readers are now able to utilize larger chunks of letters. As they gain experience with reading a vast number of new words, students begin

to recognize similar patterns of letters (Treiman, Goswami, & Bruck, 1990). Often times these patterns are meaningful morphemes, like *-ed* and *-ing* or they may be rime patterns, like *-ime* or *-eam*. Making use of consolidated units enables the reader to read with greater speed and more adeptly (Juel, 1983). Awareness of reoccurring and regularly spelled segments of English words also assists the learner in developing more appropriate phonetically legal spellings (Ehri, 1989). These phases provide a framework for understanding how individuals become efficient word readers by acquiring facility with decoding (Share, 1995).

The developmental model of reading acquisition. A more recent model of word reading acquisition expands upon Ehri's transition from partial alphabetic skills to full alphabetic representation. Savage and Stuart's model of reading acquisition (2006) suggests that after initial word reading instruction, individuals are first able to represent boundary consonants, similar to Ehri's notion of partial alphabetic knowledge. Boundary consonants are the first and last letters in a word. For example, the reader will first develop a representation of the word *sit*, as "s_t." Savage and Stuart propose that full alphabetic knowledge is hinged upon medial vowel acquisition or vowels in the middle portion of words. In fact, in their research the ability to manipulate medial vowels predicted a unique 11% of the variance in reading ability at age eight after phonological skills were controlled for at age six (Savage & Stuart, 2006). Though phonological tasks, particularly at the level of the phoneme, have been considered to have the most predictive validity for later reading, Savage and Stuart have specified that it is medial vowels which present the greatest challenge to readers and are most predictive of later word reading. In

other words, the path to full alphabetic knowledge and the ability to access decoding skills requires a well-developed identity of medial vowels.

Developing the identity of individual phonemes is particularly challenging for medial sounds. Novice readers must become skilled at hearing sounds within words in order to correctly code them with graphemes. Individuals who are able to consistently hear and represent sounds within words have established the *identity* of these sounds. Coarticulated medial sounds are particularly difficult for readers to isolate, thus the identity of these sounds may be slower to develop (Stahl & Murray, 1998).

Inconsistent vowels. Developing the identities of vowels presents a particular challenge in English. Vowels are acoustically prominent in words, which is why even struggling readers hear syllables (Shankweiler & Liberman, 1972). The alphabetic coding for vowels, however, is ambiguous. There are roughly 15 vowel sounds in English, yet our alphabet transparently codes only a fraction of these sounds (Bertucci, et al., 2003). This non-transparent coding (lacking one-to-one correspondence between symbol and sound) causes difficulty for readers. Though other languages, like Spanish, have a one-to-one correspondence between vowel symbols and vowel sounds, English is far less straight-forward because it has more vowel sounds than vowel graphemes (Katz & Frost, 1992).

Treiman et al. (1995) studied the inconsistency with which our alphabet represents vowel sounds. Consider, for example, the pronunciations *bead* and *head*. Though the spellings appear identical, the vowel sounds are different. Within a series of studies, this team of researchers attempted to establish the extent to which vowels are unpredictable in single syllable English words. They identified and coded consonant-

vowel-consonant (CVC) words from dictionary entries. Once all CVC words were identified, they located all other words that shared at least one grapheme with the target word in order to determine the consistency in phoneme pronunciations from word-to-word. They found that consonants in the initial or front position of words were pronounced consistently 96% of the time. Consonants in the final position in single syllable words were slightly less reliably pronounced (consistent 91%). For vowels, their findings were quite different. Medial vowels, the most common placement for vowels, were pronounced consistently only 51% of the time. For students already challenged with significant phonological difficulties, determining how to decode inconsistent representations of spoken sounds poses an additional hurdle.

Phonemes and Rimes: Subsyllabic Units for Instruction

Skilled word reading in an alphabetic language necessitates knowledge of *subsyllabic units* (Ehri, 1998; Lovett & Steinbach, 1997; Treiman, 1991). As the name suggests, subsyllabic units are word parts that are contained within a syllable. Because our written system is alphabetic it is necessary to understand how to combine individual letters or small groups of letters within words, rather than to read whole word as icons or logographs. Traditionally, two types of subsyllabic oral language units that have been used to prepare students for basic word reading instruction: *phonemes* and *rimes*. Instructional approaches highlighting the importance of individual phonemes, or the smallest segments of sounds within words, have sometimes been called *synthetic*.

The second type of subsyllabic units, rimes, are slightly more abstract and deserving of more description. Rimes are defined as the vowel and following consonants within a syllable. The consonant(s) preceding the vowel is often called the *onset*. This

division between onset and rime, though seemingly arbitrary, is a reflection of how speech sounds naturally cluster within spoken words (Treiman, 1991). Vowels are closely bonded to the consonants that follow them in a syllable and less closely bonded to the consonants, which precede them (Treiman, et al., 1995). In other words, there is an inherent separation between the onset and the rime in single syllable words. Treiman et al. (1995) investigated the utility of rime units among adult readers. They identified the initial consonant and following vowel in a single syllable word as C_1V , (first consonant and vowel) and the vowel followed by the second consonant(s) in a single syllable word as VC_2 (vowel second consonant or a rime). Their findings suggest that adult readers make use of VC_2 units more easily than C_1V portions of words. Put another way, rimes can be more predictably pronounced than other clusters in single syllable words, like initial consonants and the following vowel (C_1V). Thus, rimes may be more useful guides for word pronunciations.

Instruction that teaches onset and rime divisions between words has been called *analogy* instruction. The name presumes that knowing rime units like *-ack* allow the reader to analogize the pronunciations of other words (e.g., *back*, *lack*, *pack*, *rack*) (Goswami, 1986). Table 2 exhibits how the words *shack* and *flip* can be divided into these two subsyllabic units.

There has been substantial debate regarding the significance of these two units in word reading acquisition and instruction. In terms of reading acquisition, phonemic awareness has been demonstrated to have more predictive validity for later word reading ability (Muter, Hulme, Snowling, & Taylor, 1997; Nation & Hulme, 1997). In other words, the ability to manipulate individual sounds within words is a more powerful

Table 2

Divisions by Phoneme and Onset/Rime

Word	Individual Phoneme (Synthetic)	Onset and Rime (Analogy)
Shack	/sh/-/a/-/ck/	/sh/-/ack/
Flip	/f/-/l/-/i/-/p/	/fl/-/ip/

predictor of later reading than the ability to manipulate rimes. When it comes to which unit is more significant for reading instruction, however, the picture is less clear. Several studies have suggested that both units are useful for improving word reading (Juel & Minden-Cupp, 2000; Lovett & Steinbach, 1997; Savage & Carless, 2005).

A comprehensive evaluation of the relative strengths of these two subsyllabic units was conducted by the National Reading Panel (2000). The panel reviewed 39 synthetic programs (e.g., DISTAR; Engelmann & Bruner, 1975) and 11 analytic programs (e.g., Edmark; Edmark, 2011), and a miscellaneous category that included phonics programs that did not fit a pure synthetic or analytic approach (generally because the study authors did not clarify which approach was used). All three instructional approaches produced effect sizes that were significantly different than zero. Synthetic instruction resulted in an effect size of $d = 0.45$, while analytic approaches resulted in an effect size of $d = 0.27$. The difference between these two instructional approaches to teaching reading was not statistically different than zero (National Institute of Child Health and Human Development, 2000), suggesting that one method is not significantly more powerful in producing reading outcomes than the other and both may be useful for basic reading instruction.

Rime units as vowel stabilizers. Subsyllabic skills are often challenging for instructors to teach or for students to acquire because of the inconsistent nature of vowels. Early and highly influential phonemic decoding instruction managed vowel sound inconsistency by teaching students to identify all of the potential sounds a vowel grapheme makes (Orton, 1937). As Table 3 demonstrates, vowel sounds vary depending upon the consonants that surround them; the grapheme *a* makes different sounds in all of the example words below.

Table 3

Vowel Sound Variability

Subsyllabic Unit	Teach	Example
Phonemes	All sounds <i>a</i> makes	<i>cat</i> , <i>bake</i> , <i>father</i>
Rimes	Rime <i>-at</i>	<i>cat</i> , <i>fat</i> , <i>mat</i>

Instruction that uses rimes teaches the vowel and its following consonants as a combined unit. Using rime units for instruction stabilizes vowels because the rime is the instructional unit, rather than the individual vowel. In fact, Trieman et al. (1995) found that when vowels are combined with following consonants in single syllable words (i.e. rime units) the vowel sound became predictable 77 % of the time. This is 26 percentage points higher than vowels presented in isolation. In other words, rime units may serve a function beyond analogizing. They provide additional predictability to the reading and spelling of medial vowel sounds. This quality of rimes, to stabilize variable vowel pronunciations, may add to their utility in basic reading instruction.

Traditionally, theories of word reading acquisition have not explicitly addressed the differences between consonants and vowels. Savage and Stuart's (2006) model of

reading acquisition adds to the literature by suggesting that boundary consonants are a more-easily-acquired prerequisite to identifying medial vowels. Given the research that finds that adolescents with word recognition challenges possess partial alphabetic skills, this theory may provide insight into how to help older students with lingering phonological deficits. Likewise, rime units may be useful for adolescent reading instruction as they provide more predictability to vowels.

Subsyllabic Instruction for Older Students

Word reading instruction for adolescents usually takes two forms: *subsyllabic decoding instruction* and *word analysis*, sometimes called word study. Word analysis includes instruction that focuses on word-reading skills like multisyllabic decoding and affix instruction (Curtis, 2004). Word analysis is generally prescribed for students who are reading just below grade level and who have mastered single syllable decoding, whereas basic subsyllabic instruction is recommended for students who are reading significantly below their peers and lack basic decoding skills (Archer, et al., 2003).

The research reviewed here will include studies of basic subsyllabic instruction for adolescents, although the Abbott and Berninger study (1999) does include aspects of both basic decoding and word analysis instruction. While commercial programs for adolescents have gained more prominence, as adolescent literacy has become a political buzzword (Biancarosa & Snow, 2006; Deshler, Palincsar, Biancarosa, & Nair, 2007), surprisingly few of these programs have a corresponding evidence base (Slavin, Cheung, Groff, & Lake, 2008). As a result, this section will focus on research studies of instructional approaches that have been designed by researchers specifically for adolescent readers.

Lovett: Rimes or phonemes. Lovett and her colleagues from the University of Toronto designed a series of studies analyzing the effectiveness of two subsyllabic interventions on students reading below the 25th percentile on word reading measures, one focused at the level of the phoneme and the other on rimes (Lovett, et al., 1994; Lovett, Lacerenza, et al., 2000; Lovett & Steinbach, 1997). The first program, Phonological Analysis and Blending/Direct Instruction (PHAB/DI) was based on the Direct Instruction Model from the University of Oregon (Stein, et al., 1998). The program focused on synthetic blending of phonemes over the course of 35 sequenced lessons. The second program, Word Identification Strategy Training (WIST), taught participants four strategies (a) using rime based units to analogize to new words (b) identifying known parts of words (c) trying different vowel pronunciations within words and (d) segmenting affixes from multisyllabic words.

In the initial study (Lovett, et al., 1994), 62 students ages 7 to 13 were randomly assigned to either treatment and received thirty-five 60-minute sessions and were instructed by trained special education teachers. Results indicated that both groups made statistically significant gains on both print-based (i.e., word recognition) and speech-based (i.e., phonological) measures. Slight differences in performance were revealed on transfer measures with the WIST group performing better on real word identification; whereas, the PHAB/DI group performed well on the identification of both regular and irregular words.

In a follow-up study, Lovett and colleagues (Lovett & Steinbach, 1997) used the same programs to assess growth across a similar set of basic word reading skills with 122 students in grades two through six (the dose remained 35 hours). The primary purpose of

the study was to determine the extent to which students were responsive to intensive instruction at different ages. Students in all age groups exhibited the same level of growth after the 35 lessons, suggesting that there is no developmental window during which word reading is best acquired, rather similar growth in word reading skills can be achieved across grades two through six. In terms of instruction within the interventions, the findings from the previous study were again replicated; students in both programs made significant gains across word recognition and non-word tasks.

More recently, this research group assessed the effects of combining these two successful subsyllabic programs to determine if the combined programs produced stronger results and to determine the best order in which to present these interventions (Lovett, Lacerenza, et al., 2000). The study involved 85 students ages 7 to 13 scoring at least two standard deviations below age level expected norms on word reading measures. Using a sequential crossover design, they created five different treatment groups (a) 35 hours of PHAB/DI followed by 35 hours of WIST (b) 35 hours of WIST followed by 35 hours of PHAB/DI (c) 70 hours of WIST (d) 70 hours of PHAB/DI and (e) 35 hours of a strategy course (e.g., organization and study skills) followed by 35 hours of math instruction. A linear trend analysis revealed that both the PHAB/DI and the WIST interventions, separately and combined, resulted in significant gains (1 to 1.5 standard deviations) on non-word and word recognition assessments. The finding also revealed that linear trends were steepest when the PHAB/DI and WIST were combined; the order of presenting these instructional approaches did not affect gains on any of the measures.

Abbott and Berninger: Adding word study. Abbott and Berninger (1999) built upon the Lovett studies and conducted a small scale study with 20 students in grades four

through seven to assess the benefit of adding word analysis instruction with traditional decoding instruction. Marcia Henry's Words program (1990) was used for this purpose. Participants were randomly assigned to one of two groups, the primary difference between the groups being the instruction provided through the Words program. Sixteen hours of one-on-one tutoring was provided to the participants for an hour each week. The tutors were graduate students in school psychology or education. In order to assess growth, the design included phonological and orthographic measures that were assessed as pre- and post-tests, as well as select measures that were collected at an additional midpoint. Repeated-measures analyses of variance assessed growth from the beginning of the study to the end, while hierarchical linear modeling (HLM) was used to model growth on the measures that were taken at three points. Both intervention groups exhibited statistically significant improvement on all measures except non-word reading efficiency and an orthographic measure. There were no differences, however in gains between the two intervention groups. In other words, the addition of structural analysis training did not result in meaningful gains for the group that received instruction in Words. Overall, 16 hours of subsyllabic instruction resulted in approximately one-third of a standard deviation of growth.

Calhoon: Structuring adolescent instruction. Another set of studies on subsyllabic instruction for adolescents comes from Calhoon (2005; 2010). In an initial study she combined the Fuchs' Peer Assisted Learning Strategies (PALS; Fuchs & Fuchs, 2011) with Linguistics Skills Training (LST; Calhoon, 2003) for sixth, seventh, and eighth grade students in special education English classes. PALS is a intervention for improving the reading achievement of students. Through PALS, students are taught

reading comprehension strategies and peers provide additional opportunities for practice through a peer-tutoring model. The LST program teaches subsyllabic units (Calhoon refers to subsyllabic instruction as *linguistic skills*) using diacritical-like markers to distinguish between long and short vowel sounds and consonants and vowels. The program begins at the level of the phoneme and gradually moves to larger rime units. Classrooms and teachers were assigned to either the PALS/LST treatment group or a contrast group. The instruction in the contrast group consisted of *Saxon Phonics* (Austin & Simmons, 2011) for the subsyllabic instruction and the SRA Corrective Level C Skill Acquisition, a scripted comprehension program. The experimental condition received 51 hours of instruction in LST and 34 hours of PALS. The contrast group received 36 hours of decoding, spelling and fluency training, along with 49 hours of vocabulary and comprehension instruction. Significant differences were found between groups with the PALS/LST group outperforming Saxon/Corrective on Letter-Word ID, Word Attack, and Passage Comprehension.

In a recent study, Calhoon, Sandow, and Hunter (2010) attempted to determine the most effective way of organizing instruction for adolescents with reading disabilities. They contended that reading interventions for adolescents have been developed similar to programs for younger children. Adolescents will likely require many of the same skill instruction (e.g., decoding, fluency, comprehension). Still, they suggest, it does not necessarily follow that the delivery of instruction should be presented with the same structure that is given to younger children. Expanding upon the findings from the previous studies, they assessed three different arrangements of instruction: Alternating, Integrated, and Additive (see Table 4). Alternating consisted of a modified version of the

LST/PALS program, now called RAMP-UP. The program was divided into a series of modules including subsyllabic skills, spelling, reading fluency, and reading comprehension. It was structured as before with 60% subsyllabic instruction, 40% comprehension instruction.

Table 4

Calhoon Study Module Instruction

Module	Weekly Instruction					Time (%)
	Monday	Tuesday	Wednesday	Thursday	Friday	
Alternating						
Subsyllabic		✓	✓		✓	40
Spelling						---
Fluency						---
Comprehension	✓			✓		60
Integrated						
Subsyllabic		✓	✓		✓	38
Spelling		✓	✓		✓	14
Fluency		✓	✓		✓	8
Comprehension	✓			✓		40
Block Instruction						
Additive	1 st 7-week	2 nd 7-week	3 rd 7-week	4 th 5-week		
Subsyllabic	✓	✓	✓			65
Spelling		✓	✓	✓		17
Fluency			✓	✓		6
Comprehension				✓		12

The Integrated and Additive approaches consisted of various configurations of the

modules in RAMP-UP. The Integrated program was modeled after many of the large commercially available reading programs (e.g., Saxon Phonics, Wilson Reading, Language!), as it integrates spelling (14%) and fluency (8%) with subsyllabic skills (38%) three days each week and teaches comprehension (40%) two days per week. In other words, it *integrates* all instruction at once.

The final Additive model was based on LaBerge and Samuels' model of automaticity (1974), which influenced how the Additive model was structured and how it presented new skills. The Additive model was intended to develop automaticity on subsyllabic skills before attempting to add other forms of reading instruction. The course was divided into four 7-week segments. During the first segment, the focus of instruction was entirely upon subsyllabic skills. In the second segment, spelling instruction was added. Fluency skills were introduced in the third seven-week segment. In the fourth segment subsyllabic skills were removed and comprehension was added to existing spelling and fluency instruction. Students in all modules received instruction 45 minutes, five days a week, for 26 weeks.

A series of repeated-measures analyses of variance (ANOVAs) showed that all three modules resulted in statistically significant gains from pre to post testing, including word reading skills, fluency, and comprehension. The Additive module statistically outperformed the Integrated and Alternating models on subsyllabic skills, spelling, and comprehension. The Integrated and Alternating model performed slightly better on the fluency assessments.

Subsyllabic instruction findings. The studies described above for the various reading programs have significant implications for structuring word-reading interventions

for adolescents at the subsyllabic level. First, these studies suggest that subsyllabic instruction can result in meaningful gains for adolescent readers with significant reading disabilities. This is significant because instructional time for secondary students cannot be squandered. Exposure to high-quality instruction in content area classes is highly predictive of post-secondary outcomes (Adelman, 2006). As a result, any time that removes an adolescent from content-area instruction must result in meaningful outcomes for the student.

Second, the Lovett studies indicate that both instructional approaches, phonemic (synthetic) and rime-based (analogy) resulted in significant gains for students reading two standard deviations below age-expected norms on word reading measures. This suggests that learning subsyllabic units, whether as fine grained as individual phonemes or chunked rime units, may prove useful for adolescents learning basic decoding skills. Previous research has suggested that students need phonemic skills before they are able to make use of rime units (Ehri & Robbins, 1992). The findings from the Lovett study may suggest that adolescents with significant reading disabilities possess some phonemic skills, but remain unable or inconsistent at medial vowel identification. Thus, both phonemic and rime approaches provide additional instruction on medial vowels.

Third, the Lovett and Abbott studies suggest that meaningful subsyllabic instruction can take place over a very short period of time. The Lovett studies provided students with 35 hours of intervention, while the Abbott and Berninger study provided only 16. This is again meaningful when considering the importance of allowing time during the school day for content-area instruction. Understanding how to provide socially significant but brief interventions to adolescents with reading disabilities is

especially important to consider, especially given the lengthy nature of many commercially-available reading programs (Deshler, et al., 2007; Moats, 2004).

Finally, the Calhoon studies provide insight into how instruction for adolescents is most meaningfully structured. In the initial study, subsyllabic skills and reading comprehension instruction were combined and achieved statistically significant gains over the contrast intervention. The most recent study attempted to determine the best way to structure programming for adolescents with reading disabilities. The success of the Additive model has significant implications for researchers and practitioners alike. Specifically, it suggests that adolescents with reading disabilities are in the greatest position to benefit from spelling, fluency, and comprehension instruction after subsyllabic skills have become increasingly automatic.

Reading Motivation and Attitude

A notable omission in the studies reviewed to this point, is the absence of social validity data. In other words, there is no specific feedback about the interventions provided by the student participants. Though the *content* of basic word reading instruction may not change significantly from childhood to adolescence, motivation and attitude towards reading undergo meaningful changes as students transition from elementary school to middle school (Anderman, Maehr, & Midgley, 1999). Instructional approaches for adolescents must be palatable to students or well-intentioned programs may result in a decreased willingness by these students to engage with print. This final section will review three studies that provide insight into affective changes experienced by adolescent readers.

Butkowsky and Willows (1980) assessed the difference between good and poor

adolescent readers on: task expectancy (i.e., how well they expected to perform), causal attribution (i.e., what did they attribute success to?), and expectancy shift (i.e., after completing a task, how do they predict they would do in the future on the same task). The researchers asked 72 males between ages nine and twelve to complete five 5-letter anagrams. The students had been selected for the study on the basis of reading achievement scores. These scores formed three groups: poor readers, average readers, and above average readers. Prior to beginning the task, the participants were asked to predict how well they thought they would do on the puzzles (task expectancy). After completing the task, students were asked to attribute their success or failure on the anagram task to one of the following: ability, effort, task difficulty, or luck (causal attribution). Finally the experimenter asked the participant how well they predicted they might do on an additional set of anagrams (expectancy shift).

They found that lower ability students were more likely to have lower expectancy of success prior to initiating in the task. Likewise, poorer readers were more likely to give up more quickly than higher achieving students. In terms of causal attributions, low achieving adolescents in this study were more likely to attribute success to external causes (i.e., luck) and were more likely than their peers to attribute failure to internal causes (i.e., ability). Finally, the low achieving readers seemed to be more affected by failure, as they were statistically less likely to predict success on future reading anagrams.

In an earlier study, Nicholls (1979) sought to understand how causal attributions for reading change with age. Five hundred and forty students from grades two, four, six, and eight were included in the study. Participants completed two measures: one required the student to indicate how successful they perceived themselves in reading as compared

to the peers in their class. Students also completed an attribution measure, which asked them to consider a time they experienced success and failure in reading and to attribute that success to effort, luck, or ability. Finally the students' teachers ranked the students in their class by reading achievement in order to categorize the participants by ability.

Nicholls found a significant positive correlation between young students' perceived attainment and attributions of success to effort. Younger students with low ability were more inclined to rank themselves successful readers and attribute success to effort, in spite of their difficulty with reading. Older poor readers were more likely to perceive themselves as poor readers and attribute performance to low ability.

McKenna, Kear, and Ellsworth (1995) examined reading attitudes across grades one through six in a national survey using the Elementary Reading Attitude Survey (McKenna & Kear, 1990). Rather than administer a reading ability test along with the survey, they asked the teachers of the students taking the survey to categorize students as above average, average, or below average.

Their findings indicated that attitudes towards both recreational and academic reading significantly decline across grade levels. In terms of reading ability and attitude, all readers again display reductions in attitude. The most significant decreases in reading attitude are for average and below average readers, with the poorest readers exhibiting the steepest declines until reaching their lowest attitude towards reading in the sixth grade.

Considered together, these findings indicate that experiences of failure in reading take hold very quickly among adolescents and their willingness to persist on tasks and feelings of reading ability decrease with each failure. Likewise, attitudes towards reading decline as students get older. At the greatest risk of decreased attitudes towards reading

are the poorest performing students. Additional research has also indicated that struggling readers read less (Cunningham & Stanovich, 1997) and, as a result, remain significantly lower performing than their peers. Meanwhile high performers continue to advance their reading skills as they engage in reading activities, thereby increasing the gap between normally-achieving students and students with reading disabilities (Stanovich, 1986).

Purpose of this Study

The studies reviewed here point to several meaningful findings to consider in designing instruction for adolescents with basic decoding difficulties. As the reading theories presented suggest, students who have not acquired full alphabetic skills are likely struggling with developing phoneme identities for medial vowels (Savage & Stuart, 2006). In terms of interventions for adolescents, there is some evidence to suggest that older students with significant reading disabilities are as responsive to subsyllabic instruction as their younger counterparts (Lovett & Steinbach, 1997). These studies indicate that meaningful gains could take place over a relatively short period of time (Abbott & Berninger, 1999; Lovett, et al., 1994; Lovett & Steinbach, 1997). Also, the structure of reading interventions for older students may be best structured if basic skills (e.g., subsyllabic) are automatized before moving on to higher-order skills, like fluency and reading comprehension (Calhoon, et al., 2010). Finally, none of the intervention studies cited above assessed outcomes related to motivation during or after their interventions. Given the steep declines in reading motivation and attitudes among struggling adolescent readers (McKenna, et al., 1995), assessing students' motivation and the palatability of interventions is critical if we are to increase adolescents' willingness to engage with academic texts.

In an effort to further extend the literature on instruction for adolescents with word reading disabilities, this study will assess a new subsyllabic reading intervention. In keeping with the latest reading acquisition theory, this instructional approach, called Sound Effects, focuses specifically on medial vowels. The Sound Effects intervention color codes medial vowels within rime units. The use of rime units is intended to provide additional support to students who may be struggling with correctly identifying vowel sounds. The Sound Effects program is not intended as a comprehensive remedial reading program, rather it is designed to function as a subsyllabic instructional component that may be used to increase word reading identification prior to beginning more advanced reading instruction. Finally, the Sound Effects lessons contain activities that resemble traditional card games, which are intended to engage adolescent readers.

Although the Sound Effects intervention has been used in clinical settings with success, the present study represents a first attempt to formally investigate the effectiveness of this instructional approach. For this reason, this study will examine Sound Effects – a rime based approach – in contrast to a widely used synthetic reading approach, Corrective Reading and a no-treatment control group. Given, the importance of instructional time for adolescents, the success of previous studies in producing gains over a brief period of time, and gains achieved using Sound Effects in clinical settings after brief instruction, this study will examine the effects of these interventions over the course of 15 lessons. Measures assessed in this study will include word-reading, spelling, and motivation measures. Multiple spelling measures were used, as spelling represents another way to assess students' understanding of subsyllabic skills and the identities of medial vowels (Ehri, 2000).

Research Questions

This study's primary purpose is to investigate the utility of the Sound Effects intervention as a subsyllabic intervention. Additionally, students will provide input regarding the palatability of the intervention. Specifically the following four questions will be addressed:

1. Is the performance of students who receive instruction in Sound Effects significantly different from students receiving synthetic reading instruction (Corrective) and students receiving no treatment on word reading measures (non-word, word recognition, and passage fluency) after 15 hours of instruction?
2. Is the performance of students who receive instruction in Sound Effects significantly different from students receiving synthetic reading instruction (Corrective) and students receiving no treatment on measures of spelling after 15 hours of instruction?
3. What is the effect of word reading instruction for students receiving Sound Effects and Corrective on a measure of reading self-concept after 15 hours of instruction?
4. Is the Sound Effects intervention socially acceptable to adolescent struggling readers on a measure of program satisfaction?

CHAPTER IV

METHODS

Setting

This intervention study was conducted at two middle schools (referred to as the *primary* site and the *supplementing* site) in the Midwest during the fall of the 2010-2011 school year. The primary site had agreed to host the study, but did not have enough students with word-reading scores low enough to qualify for the project. As a result the majority of the participants, who were recruited from the primary school, were randomly assigned to the two interventions, while a supplementing school provided additional control students. The primary intervention school site served 392 students in grades five through eight. The vast majority of students (96%) at this school identified themselves as Caucasian. Approximately 58% of the student body received free or reduced-price lunch.

The supplementing school site was used to provide 10 control group students (the six remaining control students were drawn from the primary school). It served a population of 299 students, 98% of whom was identified as Caucasian. Thirty-one percent of the student body at the supplementing school qualified for free or reduced-price lunch.

Participants

The initial sample consisted of 54 students in grades five through eight across the two schools; ten of these students were drawn from the supplementing school to serve as controls. Students at the primary school were screened to identify struggling word readers using the Test of Silent Word Reading Fluency (TOSWRF(Mather, Hammil, Allen, & Roberts, 2004). Students scoring at or below the 30th percentile on the TOSWRF were identified as potential candidates for the project.

Next, school staff provided information verifying that the students identified by the TOWSRF had word-reading difficulties. This determination was made based upon teacher confirmation or recent failed state reading assessment scores. The 31 students initially identified by this screening process were randomly assigned to either the Sound Effects or the Corrective Reading intervention. Three students moved after pretesting or shortly after the intervention began, and two students dropped out of the study. Both of the students who dropped out of the study had been assigned to the Corrective Reading intervention. To identify control students at the supplementing school, the same screening procedure described above was used; twelve students were identified using the TOSWRF as potential controls from the supplementing school. In order to verify that the supplementing control students could reasonably be considered to be part of the same population of students that were identified at the primary school, a propensity analysis was conducted (see below). Two of the twelve students from the supplementing school control group were removed from the study based on this analysis. Given the limited number of control students identified at the supplementing school, an additional six students were located at the primary school for the control group. All had either been absent for the initial administration of the TOSWRF or their original scores had been inadvertently missed during the identification process. The final sample consisted of 47 participants, 15 Sound Effects participants, 16 Corrective Reading participants, and 16 controls. Thirty-seven of the participants were from the primary school and ten students selected for the study from the supplementing school.

Table 5 lists the demographic data collected from study participants. The sample consisted of 18 females and 29 males. Students ranged in age from 10 to 15. Forty-six of

the participants identified themselves as Caucasian, while only one student identified themselves as African American. In terms of disability, just over half of the students received Special Education services ($n = 27$), whereas 20 students had not been identified for services. Most of the students receiving individualized services were identified under the label of Specific Learning Disability. Thirty-seven or 79% of the participants received free or reduced lunch. In terms of reading scores on the TOSWRF, the sample had a mean standard score of 83.47 ($SD\ 6.47$). This corresponds to the 13th percentile or word reading skills comparable to that of readers in the fourth grade (see Table 5 for TOSWRF scores according to group).

Propensity Analysis

Due to a limited number of students reading below the 30th percentile at the primary school, a nearby school was contacted to participate in the project as a supplementing school. To ensure that the selected students at the supplementing school were appropriate matches to the original sample from the primary school, a propensity analysis was conducted (Table 6). Propensity scores estimate the probability of being assigned to a group on the basis of a set of covariates (Rosenbaum & Rubin, 1983). In this case, scores from the TOSWRF and the Test of Word Reading Efficiency- phonemic decoding subtest (TOWRE; Torgesen, Wagner, & Rashotte, 1999) functioned as covariates, as both word recognition and non-word reading or decoding ability were considered critical variables in this study.

Table 5

Participant Demographic Data

Category	Sound Effects	Corrective Reading	Control
Gender			
Male	40%	81%	63%
Female	60%	19%	38%
Age			
<i>M (SD)</i>	12.3 (0.9)	12.4 (1.5)	12.6 (1.15)
Ethnicity			
Caucasian	14	16	16
African American	1	---	---
Disability Type			
LD	5	5	5
Speech/Language	1	1	1
OHI (ADHD)	---	---	1
Mild Cognitive Impairment	---	1	2
Emotional Disability	1	2	2
No Label	8	7	7
Free/Reduced-Price Lunch	73%	69%	88%
TOSWRF			
Mean Standard Score (<i>SD</i>)	85.27 (3.35)	81.19 (8.53)	84.06 (6.01)
Mean Grade-level Equivalent	4.4	3.7	4.2

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decoding ability were considered critical variables in this study.

In mathematical terms, the propensity score, $e(x)$, can be understood as the probability of being part of the original sample population ($z = 1$ or 0), given the observed covariates (x).

$$e(x) = \Pr(z = \frac{1}{x})$$

Table 6

Propensity Analysis for Final Sample

Observed	Group Assignment		Percentage Correct
	Predicted		
	Supplementary	Primary	
Supplementary	2	16	89%
Primary	0	31	100%
			96%

Propensity scores were calculated using logistic regression (Hahs-Vaughn & Onwuegbuzie, 2006). Group assignment to either the supplementary sample or the primary sample was used as the dependent variable, while TOSWRF and TOWRE scores were entered as predictor variables.

The analysis predicted that 16 of the 18 supplementary students would be grouped with the primary sample. Two control students from the supplementing school had a lower probability of being part of the original treatment sample based on their TOSWRF and TOWRE scores. These students were removed from later analyses.

Power Analysis

Given the small number of participants, a compromise power analysis was conducted using G*power. A compromise analysis is useful when presented with pragmatic constraints, in this case, the study's small sample size (Buchner, Erdfelder, & Faul, 1997).

The following parameters were specified in the compromise analysis: a sample of 47, three treatment groups, and β/α ratio of one. To calculate the effect size using Cohen's d (1992), the results indicated that only a large effect ($d = .80$) would be detectable with this sample size ($1-\beta = .92$). Small ($d = .20$) and medium effects ($d = .50$) reduced power substantially ($1-\beta = .56$ and $.76$, respectively).

Intervention Programs

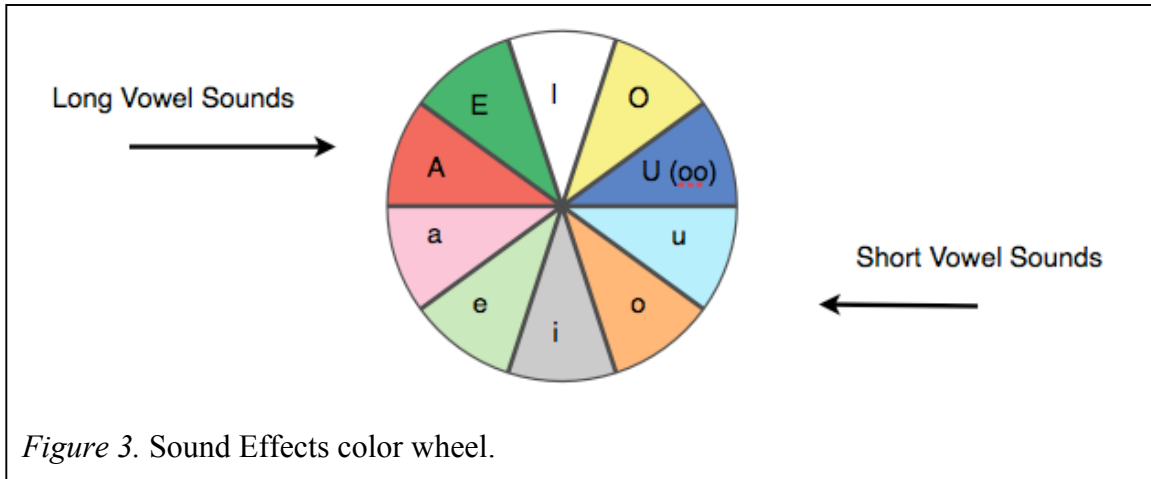
A clinician and teacher, influenced by Orton-Gillingham reading training and later experiences as a student in Jeanne Chall's Harvard Reading Laboratory, developed the Sound Effects intervention. This instructional approach has been refined and used in clinical settings for several years, but the current study represents the first attempt to formally assess its effectiveness.

Sound Effects uses rime units with color cues to support struggling readers as they retrieve and produce vowel sounds. Onset and rime color-coded playing cards as well as a color-wheel game board are key elements of this instructional approach. For this study, a corresponding lesson book was developed, which provided students with specific instruction in basic orthographic rules.

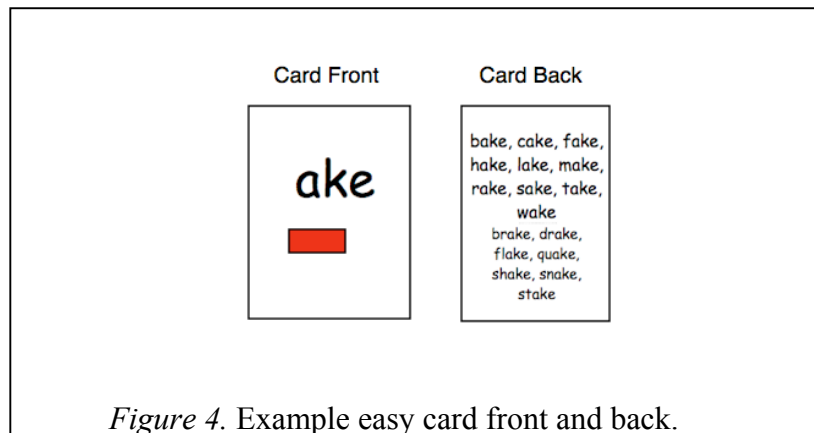
In order to appropriately assess the effectiveness of Sound Effects, an evidence-based program was required to provide a comparison. Corrective Reading, a widely used direct instruction program was selected because of its focus on teaching individual phonemes (i.e., synthetic phonics), rather than onset-rime units. This program is teacher-scripted, and materials are primarily student lesson books and workbooks. Fifteen tutoring sessions were provided to students. Previous research has indicated that students can make significant gains on word reading assessments in as little as 16 hours of subsyllabic instruction (Abbott & Berninger, 1999). Likewise, Sound Effects has been used in clinical settings with socially significant gains in as few as 15 hours.

Sound effects. The Sound Effects lessons prepared for use in the study were designed for adolescents who experience difficulties with basic decoding and, as a result, word recognition and spelling. The tutoring materials consisted of the following tools: the color wheel game board, playing cards, an onset board, and a lesson book.

Color wheel and cards. The color wheel game board is a flat black 18 by 18 inch plastic square printed with a circle, which is divided into 10 colored segments. Each colored segment represents a vowel sound (see Figure 3). The actual game board is not printed with letters; the letters are represented here for illustrative purposes. The color wheel game board is used during instruction with the corresponding rime playing cards.



Two separate decks of cards were used during instruction, an easy deck and a difficult deck. Within each of the two decks are tan onset cards (e.g., sh, m, t) and color-coded rime cards (ame, eet, oot) that match the game board colors. The rime cards have a front and back; the rime unit (e.g., ame) is printed on the front, and the rime family is displayed on the back of the cards (e.g., *dame, fame, game, lame*; see Figure 4). The easy deck contains basic long and short vowel patterns. For example, the easy deck contained patterns such as vowel-consonant-e, same-letter vowel teams (e.g., ee, oo), and short consonant-vowel-consonant cards. In all, the easy deck consisted of 33 short vowel rime cards, 36 long vowel rime cards, and 36 onset cards. The difficult deck contained 24 short vowel cards, 29 long vowel cards, and 36, and 16 onsets cards (see Appendix A for all onset and rime cards).



Lesson book. The lesson book contained 15 lessons focused on teaching a specific skill to bolster decoding and spelling. Table 7 provides a listing of all of the lessons.

Sound Effects lessons were divided into five major sections: rime card sorting (i.e., Warm-up), finding rhyming words, reading and spelling, phrase and sentence reading, and games using the color wheel and cards. Each lesson was designed to last between 30 and 45 minutes. A sample lesson may be found in Appendix B. Each of the main sections of the lessons will be described below.

Rime card sorting (2-3 minutes). The sorting task uses the color wheel game board and a deck of the rime cards (the lessons specify the use of easy or difficult cards). Students were asked to say the rime clearly as they placed the card on the appropriate colored segment of the color wheel. For the first nine lessons, students sorted the cards onto the wheel using the front of the card (color-code rime unit); during lessons 10 through 15 students, sorted the rime cards onto the wheel using the back of the card

Table 7

Sound Effects Lessons

Lesson Number	Skill	Example Words
Lesson 1	Long Vowel Sounds & Silent e	<i>Blaze, bleep, chide</i>
Lesson 2	Short Vowels & Doubling	<i>Dimmed, sagged, rotting</i>
Lesson 3	Long & Short Vowels with -ing	<i>Flaking, slopping, spiking</i>
Lesson 4	Vowel Teams	<i>Brains, gloats, leaned</i>
Lesson 5	R-sounds, Long and Short	<i>Bare, charm, dirt</i>
Lesson 6	Adding -er to Long and Short	<i>Chatters, beater, spiders</i>
Lesson 7	Hard Short Vowel Patterns	<i>Slanted, drifted, grunted</i>
Lesson 8	Diphthongs (i.e., The Outlaws)	<i>Boil, clown, lawn</i>
Lesson 9	L-sounds, Long and Short	<i>Able, vandal, pencil</i>
Lesson 10	Two-syllable Words & Dotting	<i>Regal, bison, mutant</i>
Lesson 11	The Y-syllable	<i>Lazy, creepy, dizzy</i>
Lesson 12	Two Syllable Long Vowels	<i>Debate, confide, promote</i>
Lesson 13	Two Syllable Short Vowels	<i>Inflict, accost, corrupt</i>
Lesson 14	-tion & -sion	<i>Station, elation, renovation</i>
Lesson 15	Changing Words	<i>Sense, sensation, sensational</i>

(uncolored rime family words). The rime sorting task was intended to help students develop clearer vowel sound identities. Sorting the cards from the back was expected to help reduce dependency on color cuing and reinforce recognition of rime patterns.

Finding rhyming words (10 minutes). Students read several words from the rime family on the back of the card and then flipped the card back to the front. Using a chart with onsets (consonants and consonant blends), students attempted to remember the words that had just read and recreate the word using the card and the onset chart. Students read the rime card first before blending it with the onset (e.g., “ine,” “fine”).

The rhyming task was designed to reinforce students' verbal memory and to help them connect verbally produced words with printed words (see Appendix C for the chart).

Reading and spelling (10 minutes). Words that exemplified the lesson's critical skill (see Table 7) were printed and sorted onto a graphic of the color wheel by vowel sound. The graphic was intentionally printed in black and white to reduce some of the support provided by the color-coding. This portion of the lesson led directly into the spelling segment of the lesson.

The spelling words were listed in three columns; each column contained five to 12 words with the same spelling pattern (e.g., -y, -iest, -iness). Students first read the spelling words down each column and then practiced spelling nine words for each lesson or three rows of words (e.g., *happy, happiest, happiness*). The tutor was instructed to read the word and provide assistance to students as they spelled, rather than after they completing the spellings. Students were also encouraged to spell by syllable.

The reading and spelling sections were intended to be slightly more challenging than the sorting and rhyming tasks, as the color scaffold was removed. Still this section organized words to support students. For example, the reading words were sorted onto a black-and-white image of the board, and the spelling words were organized into consistent word families.

Phrase and sentence reading (5 minutes). Students were asked to read short phrases followed by a set of sentences. Both the phrases and sentences contained words with patterns specific to the lesson's focus. To reduce the support of context, phrases and sentences used decodable, but less common words and word combinations. This portion of the lesson also contained the least amount of visual support. The phrases and

sentences were designed to function as a generalization activity, as students would need to apply their acquired skills from previous lesson sections to read accurately.

Games (15 minutes). Sound Effects cards were used during the last 15 minutes of the lesson to play one of five games. All of the games involved blending the onset cards with the rime cards. As before, students were instructed to read the rime card before blending it with the onset (e.g., “ame,” “blame”). Games necessitated reading both real word combinations and non-words. In later lessons, games were timed, and students were encouraged to increase word reading fluency each lesson.

The card games are the most critical component of Sound Effects. Card games enable the student to engage in controlled and extensive practice. These activities were intended to reinforce correct identification of vowel sounds and blending of rimes with an onset; heavy emphasis was placed on speed and accuracy.

Corrective reading. The Corrective Reading decoding series (Engelmann, 1999) was designed for students in grades 4 through 12 who are reading at least one year below grade level. The decoding strand consists of four levels: A, B1, B2, and C. All of the students who were randomly assigned to this intervention were placed into levels B1 or B2 using Corrective Reading’s placement tests. Both levels contain 65 lessons each, but students in the intervention received only Lessons 1-15. While research on the program’s effectiveness has been called into question when measured against stringent design standards (What Works Clearinghouse, 2010), Corrective Reading has been acknowledged as a program that is: widely used by schools, based on sound reading theory, and has been tested empirically (Archer, et al., 2003; Florida Center for Reading Research, 2004).

For both B1 and B2 (see Appendix D), each 45-minute lesson is scripted for the instructor and divided into four sections: word attack skills, group reading, individual reading check-outs, and workbook exercises. The materials consist of a teacher presentation book, a student book, and a student workbook.

Word-attack skills (10 minutes). B1 word-attack skills include pronunciation (phonemic awareness), sound, and word reading activities. These activities are accomplished using oral listening and production tasks (e.g., “The first sound in lip is llllll.”), dry-erase boards, and rows of printed words in the student book. The word-attack skills in B1 vary, but these lessons focused more on segmenting individual phonemes than other levels of Corrective Reading do. The correction procedure, used whenever students made a mistake, required students to repeat the individual phonemes in the missed word.

B2 word-attack skills involved using dry-erase boards to systematically manipulate sounds (usually vowels) in a list of words and reading from rows of words in the student book. In some rows, consonant blends or vowels are underlined, and students were to say the underlined part before reading the word. Word attack in B2 also includes words that were used for the controlled passage reading. The correction procedure in B2 required students to orally spell misread words.

Group reading (B1 15-20 minutes, B2 10-15 minutes). The group readings for B1 did not begin until Lesson 3, as the first two lessons were heavily focused on word-attack skills and pronunciation. Starting with Lesson 3, the group reading consisted of a series of sentences until Lesson 11, when narratives are introduced. Students practiced reading these sentences aloud without making mistakes; any mistakes were corrected by

asking the student to identify the missed word and reread the sentence. The narratives were divided into sections, and students were asked a series of comprehension questions at the end of each section.

Group readings for B2 began in Lesson 1. The stories incorporated the words used during the word-attack exercises and increased in length and difficulty across the lessons. The correction procedure in B2 was the same as in B1; students reread the missed word and then reread the sentence containing the missed word. As in B1, students were asked comprehension questions throughout the reading.

Individual reading check-outs (10 minutes). In B1, reading check-outs began with Lesson 6. Check-outs are timed one-minute reading fluency checks. In Lessons 6-10, students reread the sentences from the Group Reading and attempted to make no more than two errors. In Lessons 11-15, students transitioned to rereading the first section of the day's narrative rather than simple sentences.

Check-outs for B2 involved rereading the narrative from the Group Reading. Lesson 2 marked the beginning of a consistent pattern for the check-outs. Students first practiced rereading the first section of the current lesson's narrative, then they read the first section of the narrative from the previous day's lesson for one minute. Students charted the number of errors they made during the second check-out and the total number of words read.

Workbook exercises (10 minutes). The workbook exercises were structured similarly to B1 and B2, although the content varies. B1 workbook lessons were teacher-directed, whereas the B2 workbook lessons were only directed by the teacher for a few minutes, if at all. The workbook exercises mirrored some of skills practiced previously

during Word Attack, and B2 focuses more on comprehension, requiring the student to recall specific details from the Group Reading.

Measurement Instruments

Test of Silent Word Reading Fluency. (TOSWRF; Mather, et al., 2004) This measures students' word reading fluency without having them read aloud; instead students are given a test form with rows of words without spaces between the words. The rows contain increasingly difficult words. The examinee is given three minutes to draw lines between the words in each row. For example, the student's drawn lines change "ofgoliketwobig" to "of/go/like/two/big." Participants are directed to complete as many rows in order as they can in the allotted time.

The TOSWRF was used as a measure of students' word recognition. Scoring of this assessment followed the procedure described in the manual. The raw score for the TOSWRF is an estimate of the number of words students were able to identify in the three minutes allowed. Raw scores were converted into standard scores.

Test of Word Reading Efficiency (TOWRE): Phonemic decoding subtest. (Torgesen, et al., 1999) The phonemic decoding subtest is a non-word reading fluency assessment. Participants are asked to read a set of eight practice non-words of increasing difficulty. After reading the practice list, the examiner directs the student to read non-words of increasing difficulty. Students are directed to read as many non-words as quickly as they can in 45 seconds. This assessment was used as a measure of decoding ability. The raw scores for the TOWRE are computed as the number of total non-words read correctly. The raw score was converted into standard scores based on the norms provided in the scoring manual.

Oral Reading Fluency. (Mellard, Woods, & Fall, in press) Oral reading fluency was measured using two fourth-grade-level expository texts selected from Open Educational Resources (OER Commons, 2007). Both passages had a Lexile score of 540L. The following were considered errors: mispronunciations, word substitutions, omitted words, hesitations (three seconds or more), and reversals (National Center on Student Progress Monitoring, 2009).

Examiners presented both passages in random order and asked participants to read aloud from them. Readings were digitally recorded for later scoring. To score, the number of errors and the total word read correctly were tabulated for both readings. They were then averaged, resulting in an average error score and an average words-read-correctly-per-minute score.

Wide Range Achievement Test (WRAT) – Spelling subtest. (Wilkinson & Robertson, 2006) This spelling assessment consists primarily of the examiner dictating words of increasing difficulty. The word is first read in isolation, then read in a sentence, and then repeated for the student. The basal on this assessment is set at six words. If students misspelled any of the first six words, they were directed to write their name and 13 letters. After 10 spelling errors in a row, the examiner indicates that the subtest is complete.

Recent research has indicated that the WRAT spelling subtest is not sensitive to subtle changes in spelling ability (Masterson & Apel, 2010a). It was included in this study because it provides normed scores; it was not expected to accurately reflect all changes to students' spellings.

To score this measure, the assessment's raw score is determined by adding the number of correctly spelled words to 15 (the number of points given for writing their name and 13 letters). This raw score was converted into standard scores, which were provided in the scoring manual.

SPELL-2 Words and the SSS Metric. (Masterson, Apel, & Wasowicz, 2006)

The SPELL-2 software is a diagnostic spelling assessment that analyzes students' misspellings and generates a report with recommendations for improving students' spellings. A selector module determines which level students will be placed in for the main assessment. Students then begin the main modules. Depending upon where they place, students spell between 82 and 182 words.

SPELL-2 was administered to small groups of students across two to three days for approximately 40 minutes each day. Study participants tested into levels two through four; each level required students to spell between 141 and 182 different words. In addition to providing prescriptive information, SPELL-2 allows the administrator to print a complete list of misspelled words.

The misspellings for each student were collected. From this list two reviewers identified words, primarily single-syllable words, with vowel patterns that were reviewed in the interventions. Thirty words were selected from the misspellings for each student.

Given the time-intensive nature of SPELL-2 (nearly two hours in length) control participants were not given the computerized assessment. Instead, the misspellings for students in the interventions were calculated by frequency of occurrence. The 30 most commonly misspelled words were given to controls at both pre- and post-testing. The

same procedure was used for any student who was unwilling to complete the computerized assessment.

Pre- and post-spellings were scored using the Spelling Sensitivity Score (SSS) metric (Masterson & Apel, 2010b). This scoring procedure is more sensitive to spelling growth than traditional measures, which score target words as either correct or incorrect. The SSS assigns 0-3 points for each element of the word depending upon the element's representation as correct, legal, illegal, or omitted (Table 8). Word elements may consist of phonemes, juncture changes, or affixes. In the example, *chain* has three elements, each worth three points (e.g., /ch/-/ai/-/n/).

Table 8

SSS Scoring Example for Long A Element

SSS Scoring Categories	Actual Spelling	Points Awarded
Correct	<i>chain</i>	3
Legal	<i>chane</i>	2
Illegal	<i>chene</i>	1
Omitted	<i>chn</i>	0

The SSS metric resulted in two scores for each students' spellings, the Elements score (SSS-E) and the Words score (SSS-W). Both of these scores were obtained using the instructions provided in Masterson and Apel (2010b, p. 37). Specifically, the SSS-E was determined by dividing the total number of element points the student earned by the total number of elements possible. The SSS-W, in turn, was calculated by dividing the total number of word points earned by the student by the total number of word points possible. The resulting scores ranged from 0-3; 0-1 indicated weak skills, 1-2 indicated that the students' spellings were legal, and 2-3 indicated a more appropriate

understanding of English spellings.

Reading Self-Concept Scale. (Chapman & Tunmer, 1995) This scale is aimed at measuring the reading subcomponent of academic self-concept. It consists of 30 items representing three related aspects of reading self-concept: perceptions of competence in reading, perceptions of difficulty with reading, and attitudes towards reading. Though this measure was originally written for early school-aged populations, it was used in this study with slight revisions to language to be appropriate for adolescents. Specifically, “reading class” was changed to “English class,” and select items were reworded to reflect standard American English (e.g., “Do you like reading to your Mum and Dad?” was changed to “Do you like reading to your family?”). The questions were read orally, and students were asked to respond to a 5-point Likert scale ranging from “Yes always” (“5”) to “No Never” (“1”). The number of practice items was decreased from 10 to 4 and reworded to reflect age-appropriate activities (e.g., “Do you like to play video-games?”).

Student satisfaction survey. Students who participated in the intervention portion of the study also completed a satisfaction survey to assess: (a) how much they learned and (b) their satisfaction with their assigned intervention (see Appendix E). Students indicated their agreement with 11 Likert-scale-rated questions ranging from “Strongly Disagree” (“1”) to “Strongly Agree” (“7”). A final item allowed students to indicate which reading intervention they would prefer. Participants could select among “Corrective Reading,” “Sound Effects,” or “Voyager.” The school provided Voyager instruction using Title I funding. Over half of the participants had received Voyager instruction in the past or were currently being instructed in Voyager during the day.

The survey was group administered to decrease the potential of individual students feeling pressured to respond favorably in order to appease the study tester. The directions reminded students to be as honest as possible. Both the directions and the items were read aloud. Answers were confirmed individually with any students who missed items or answered questions inconsistently. Means and standard deviations were calculated for the Likert-scale items. For the final question, the preferences were grouped by intervention and percentages of preference were calculated.

Fidelity checklists. Brief checklists were developed to review tutors' adherence to the written procedures of their assigned program (see Appendix F). Tutors were scored on six behaviors critical to their intervention.

Sound Effects tutors were rated on the following behaviors:

1. Tutor reminds student to say the rime card first and then read the whole word.
2. Tutor's pace is fast and consistent throughout.
3. Tutor prompts student with the vowel sound when the student is struggling.
4. Tutor ensures that both students read all words in parts 2 and 3.
5. Tutor uses visual clues to cue students.
6. Tutor correctly awards points.

Corrective Reading tutors were rated on the following behaviors:

1. Tutor follows script in teacher's presentation book.
2. Tutor's pace is fast and consistent throughout.
3. Tutor uses signal immediately after speaking to cue student.
4. Tutor correctly follows correction procedure.
5. Tutor's transition time in-between exercises is brief.

6. Tutor correctly awards points.

Points on each of the six behaviors ranged from 0-2. Two points indicated that the critical behavior was both present and correct. One point indicated that the behavior was present some of the time, but needed improvement. Zero points indicated that the critical behavior was missing.

Fidelity checks were conducted within the first two weeks of tutoring to provide written feedback to tutors on their initial lessons; checks lasted approximately 45 minutes (length of initial tutoring sessions). Additional checks were conducted on 20% of the lessons or approximately three lessons per tutor.

Reliability. Interrater reliability checks were conducted for 20% of each tutor's instructional sessions. The study author and the study's Corrective Reading trainer determined scores for fidelity checks. Both listened to the identified lesson and, using the fidelity checklist, awarded the tutor points based on the checklist's 0-2 point scale. Any disagreements were resolved between the scorers until 100% agreement had been established.

Procedure

Twelve undergraduate students from a nearby university and four retired teachers provided tutoring in the study's interventions. Each tutor worked with two students. Instruction took place at small tables, which were spread throughout the center of the school library. Sound Effects and Corrective Reading, respectively were provided after school; however, the school's Title I staff offered Voyager instruction to a majority of the participants during the day. Voyager does not provide systematic decoding instruction,

but rather is focused on prosodic passage reading, vocabulary and comprehension (Florida Center for Reading Research, 2005).

Tutor training. Tutors were recruited from two pools, university students participating in a work-study program (12) and retired teachers (4). Before the tutor training sessions, both groups of tutors were randomly assigned to receive training in either Sound Effects or Corrective Reading. Tutors were provided with a single day of training in their respective interventions by the researcher (Sound Effects) and a certified teacher experienced with the intervention (Corrective Reading). A Blackboard© site was designed to provide additional resources to tutors. Blackboard (2011) is a web-based instructional tool that allows instructors to share resources with selected users. In this case, the Blackboard site contained videos of lessons, sample lessons, and a required reading and assessment for tutors to complete following the training. A criterion of 80% accuracy was required on the assessment before the tutors could begin instruction. Work-study students were required to practice during their work hours for two weeks prior to beginning intervention. Each tutor was assigned a pair of students to work with in a small group.

Identifying students. Students were initially identified as potential participants for the study on the basis of their word-reading ability. At both schools, all students in grades 5-8 were given the TOSWRF. This group-administered assessment was then scored, and students scoring beneath the 30th percentile were identified for a second round of screening. For the second round of screening, school and research staff met to determine which students would be appropriate candidates for the study, specifically to confirm students were truly poor word readers. The school guidance counselor, Title I

teachers, and English department staff helped to verify the word reading difficulties experienced by students.

In addition, state assessment reading scores were taken into account. It was initially proposed that students had to fail the state reading assessment to participate in the study, but it became apparent early in the process that some students were able to pass the state assessment despite exceptionally low TOSWRF scores. In light of research by Catts, Hogan, Adlof (2005), this was not entirely unexpected. These authors found that the variance in reading comprehension scores changes over time, with word reading skills accounting for less variance as students continue on to secondary grades. Given these findings, it was decided that state reading scores should be noted, but failure on the state assessment was not required for participation in the study.

After the study candidates had been identified, letters were sent home with students to explain the study and to solicit parents' permission for their son/daughter to participate in the study. Many of the students who consented to be part of the study were already receiving instruction in a scripted intervention, Voyager Passport, provided by the school to struggling adolescent readers through the Title I program. This intervention consists of three primary modules within each instructional unit: word study, comprehension and vocabulary, and fluency (Florida Center for Reading Research, 2005). The word study portion of the intervention focuses on teaching multisyllabic decoding strategies and affixes, rather than basic subsyllabic decoding skills. Because the interventions provided as part of the study were focused on subsyllabic skills it was determined that students could continue to receive the school-sponsored intervention in addition to the study intervention. Nonetheless, efforts were made to ensure that students

receiving Voyager intervention were evenly distributed across the two intervention assignments.

Consenting students were randomly assigned to either Sound Effects or Corrective Reading using Excel's® random number feature. Students were assigned in two waves. First, the group of participants who were not receiving Voyager were randomly assigned across the two interventions. Next, the students receiving Voyager instruction were randomly assigned across the two conditions. Students were not randomly assigned to the control condition; the participants assigned to this condition were either from the primary school and had been missed in the initial identification process (absent during testing or scorer error) and were consented later (7) or were from the supplementing school (9).

After students had been assigned to either Corrective Reading or Sound Effects, students were divided into pairs of two. Several factors influenced pairings, including after-school availability, grade level, and pretest reading scores. Non-word (TOWRE) and real-word reading (TOSWRF) scores were matched as closely as possible among pairs.

An additional constraint existed for Corrective Reading students. This intervention included a placement test, which assigned the student to one of the program's decoding levels. As a result, Corrective Reading students also had to be paired on the basis of their placement test.

Tutoring. Students received instruction two days weekly after school between October and December of 2010, for a total of 15 hours. The instructional time was constrained by the availability of the tutors. If students missed an after-school tutoring

session, they were pulled from a non-core content class during the following school day and provided the missed lessons by the researcher.

Research Design and Analysis

This study used a quasi-randomized control-group design to compare Sound Effects to Corrective Reading and a no-treatment control group. Using repeated-measures multivariate analyses of variance (MANOVAs), group assignment served as the independent variable, with two groups of measures serving as dependent variables (TOSWRF, TOWRE, and passage reading; WRAT and SPELL). A series of repeated-measures ANOVAs were used to assess differences for intervention groups on the Reading Self-Concept Scale and its subscales. Finally, a *t*-test was used to evaluate students' satisfaction with their assigned intervention.

CHAPTER V

RESULTS

Initial analyses revealed that the dependent variables were moderately correlated ($r = 0.3$ to 0.6). As a result, multivariate analyses of variance (MANOVAs) were conducted for the first two research questions. The first MANOVA was conducted to determine if differences existed between the participants in Sound Effects, Corrective, and the no-treatment group on word reading variables (TOWRE, TOSWRF, ORF), while the second MANOVA assessed differences between groups on the spelling variables (WRAT, SSS-E, SSS-W). A series of repeated-measures analyses of variance (ANOVA) were conducted to answer the third research question related to reading self-concept. For the final question, a t -test was used to assess program satisfaction differences between the two intervention groups.

Group Differences on Word Reading Variables

Descriptive data for treatment groups on the word reading variables are presented in Table 9. The effect sizes reported in Tables 9 and 10 were computed by determining gain scores for all groups and then subtracting the control group's mean gain score from the treatment group's gain score. This score was then divided by the pooled standard deviation of the treatment and control group. In the first MANOVA the independent variable (group) included three levels: Sound Effects, Corrective, and the no-treatment group. The dependent variables consisted of the TOWRE, TOSWRF, and ORF. Results revealed that there was not a significant effect for the Group x Time interaction, $F(6, 84) = .605, p = .73$. This finding indicated that neither treatment group was more effective than the no-treatment group at improving word reading variables from pre- to post-test.

Table 9

Means, Gain Scores, and Effect Sizes for Word-Reading Measures

	<i>n</i>	Pretest		Posttest		Gain Scores		<i>ES</i>
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>d</i>
<i>Sound Effects</i>	15							
TOWRE		78.07	11.23	78.60	10.59	.53	4.27	.16
TOSWRF		85.27	3.35	88.53	6.68	3.27	6.66	.41
ORF		88.33	21.11	90.30	26.13	6.97	9.89	-.37
<i>Corrective</i>	16							
TOWRE		78.75	8.97	79.19	8.67	.44	3.90	.14
TOSWRF		81.19	8.53	84.31	10.82	3.13	5.62	.43
ORF		74.75	24.89	84.13	22.47	9.38	13.05	-.09
Control	16							
TOWRE		78.50	11.15	78.44	11.60	-.06	3.15	
TOSWRF		84.06	6.01	84.88	6.93	.81	5.38	
ORF		88.97	25.82	99.31	29.98	10.34	8.23	

Group Differences on Spelling Variables

A second MANOVA was conducted to determine the effect of the intervention groups on three related dependent variables (WRAT-spelling, SSS-E, SSS-W).

Table 10 contains the means and standard deviations on the dependent variables for the three groups. Significant differences were found among three groups on the dependent measures between the pre- and post-tests, Wilks' $\Lambda = .267$, $F(6, 64) = 9.962$, $p < .001$.

Post hoc ANOVAs indicated that the Group x Time differences were the result of increases on the SSS-W, $F(1,10) = 72.799$, $p < .001$; and SSS-E, $F(1, 11) = 57.844$, $p < .001$.

.001, scores for Sound Effects. Likewise, significant gains from pre- to post-testing were found for Corrective on the SSS-W, $F(1, 11) = 147.117, p < .001$, and SSS-E, $F(1, 11) =$

Table 10

Means, Gain Scores, and Effect Sizes for Spelling Measures

	<i>n</i>	Pretest		Posttest		Gain Scores		<i>ES</i>
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>d</i>
<i>Sound Effects</i>	15							
WRAT		85.82	2.57	86.64	2.43	.27	2.94	-.22
SSS-W		1.36	.12	2.01	.13	.65**	.25	2.76
SSS-E		2.37	.06	2.59	.06	.21**	.10	1.83
<i>Corrective</i>	16							
WRAT		87.92	2.46	89.00	2.33	1.06	4.14	.02
SSS-W		1.42	.11	2.13	.13	.71**	.20	3.51
SSS-E		2.41	.06	2.62	.06	.21**	.09	1.85
<i>Control</i>	16							
WRAT		83.86	2.28	84.714	2.15	1.00	3.60	
SSS-W		1.79	.10	1.848	.12	.06	.17	
SSS-E		2.42	.05	2.475	.05	.05*	.08	

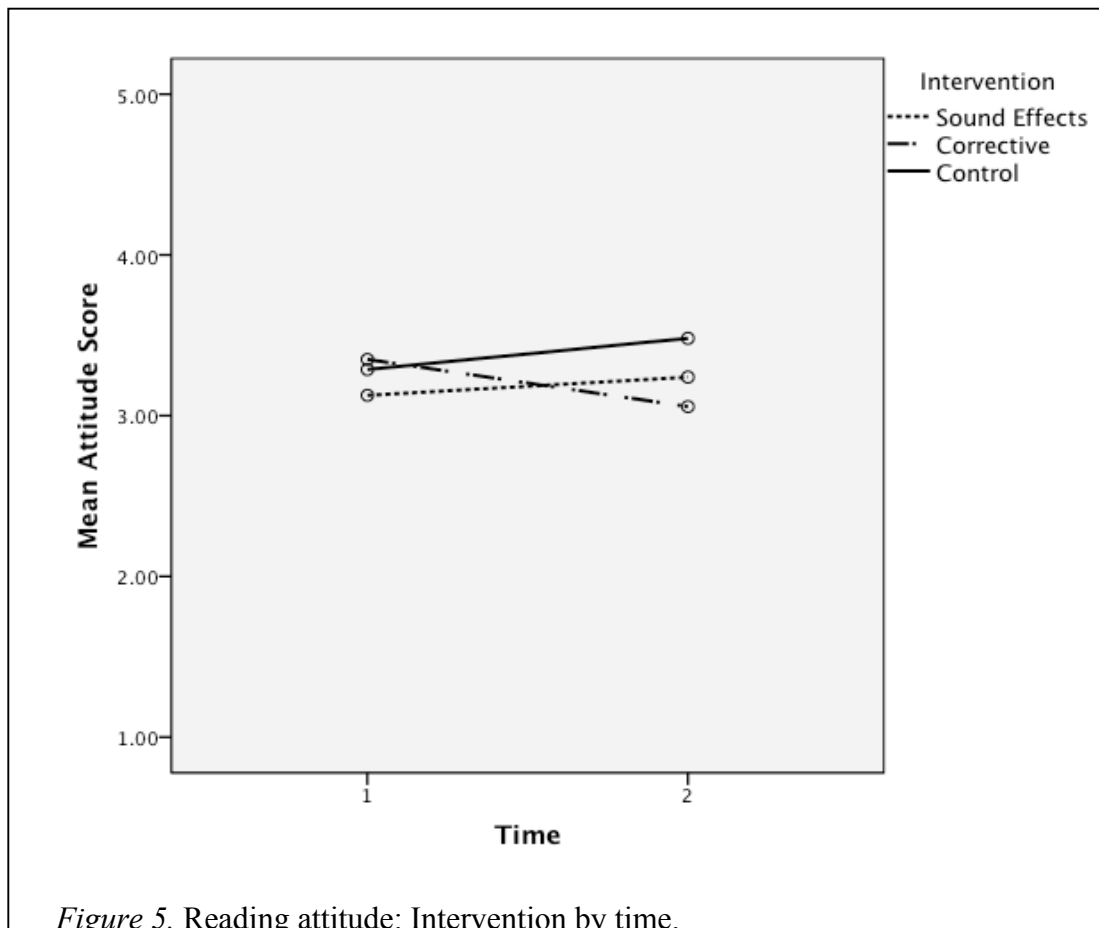
Note. * $p < .05$. ** $p < .001$.

61.573, $p = < .001$. The no-treatment control group also exhibited gains over time on the SSS-E, $F(1, 13) = 6.250, p = .027$, but not on the SSS-W. None of the groups showed statistically significant gains on the WRAT-Spelling subtest from pre- to post-testing.

Group Differences on Reading Self-Concept

In order to answer the third research question, a series of repeated-measures ANOVAs were conducted to determine how group assignment affected overall reading

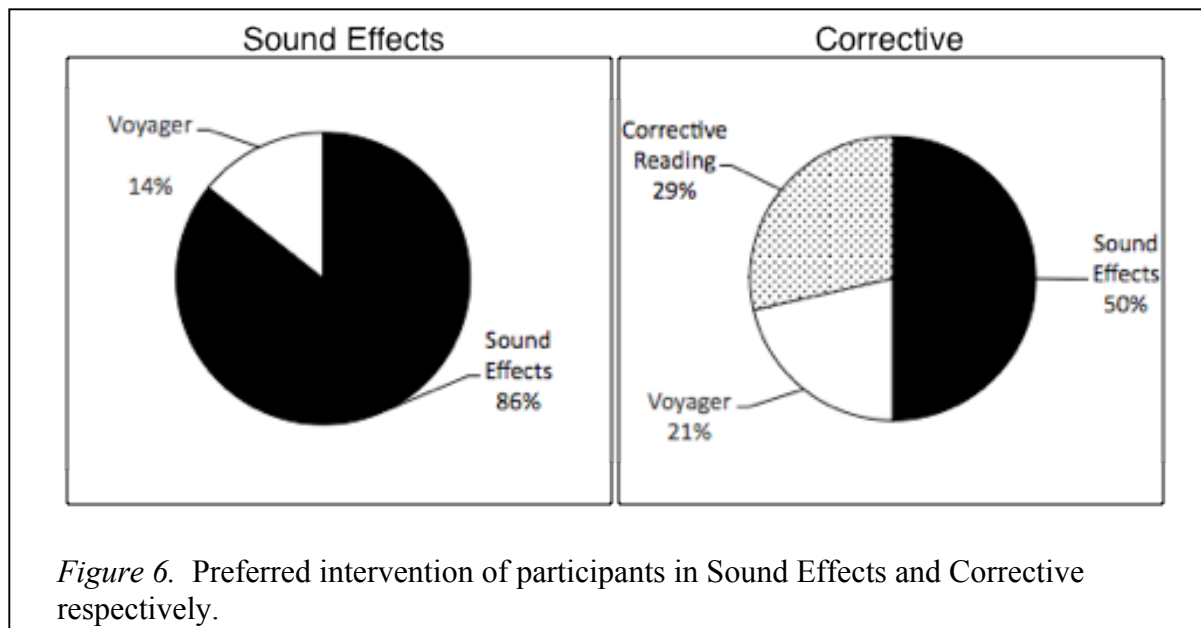
self-concept and the components of self-concept. Results revealed that there was not a significant effect for overall reading self-concept according to group, $F(2,44) = .825, p = .45$. The three subscales for reading self-concept were also considered by intervention. Results indicated that students' perception of reading difficulty did not vary significantly by intervention, $F(2,44) = .917, p = .41$. An ANOVA of the competence subscale revealed no significant differences across intervention, $F(2,44) = .069, p = .93$. Results for the reading attitude subscale, however, indicated significant differences by intervention from pre-test to post-test, $F(2,44) = 3.46, p = .04$, with students in the Corrective intervention reporting statistically lower attitudes towards reading after completing instruction in the intervention. Figure 5 displays a mean plot by intervention on the attitude scale.



Program Satisfaction

The final research question was related to the palatability of the Sound Effects intervention among secondary students. The Student Satisfaction Survey was used to assess the extent to which students in Sound Effects and Corrective considered their word reading skills improved and to what extent they attributed this improvement to the instruction they had received (see Appendix E). The original measure contained 11 items, all related to either students' perception of learning or their feelings about their intervention. In order to assess these survey items statistically, the two clusters of items were combined into two small scales. Coefficient alphas were conducted on both scales, indicating that the newly created Perception of Learning Scale was sufficiently reliable ($\alpha = .73$), where the proposed Feelings Towards Intervention Scale was not reliable ($\alpha = .17$). As a result, only the first scale was used for an additional analysis. The Perception of Learning Scale was used to assess differences in perceptions of learning between the students in Sound Effects and Corrective. An independent samples t -test was conducted and revealed statistically significant differences between the two groups, $t(25) = 2.11$, $p = .045$, with students in Sound Effects rating their learning on average four points higher than Corrective participants on the combined scale.

A final question of the Student Satisfaction Survey asked participants to consider which reading intervention they would prefer to continue receiving: Sound Effects, Corrective, or Voyager (see Figure 6). Participants in the Sound Effects intervention primarily opted to remain in Sound Effects (86%), with only two students choosing the Voyager program (14%). None of the Sound Effects participants chose the Corrective intervention.



Within the Corrective group, half of the students indicated that they would prefer to participate in Sound Effects, while 29% preferred to remain in Corrective, and 21% of the students chose the Voyager program.

Fidelity of Implementation

Two scorers (the study author and a certified Corrective professional developer) reviewed 20% of all recorded tutoring sessions. Any scoring disagreements were resolved until 100% agreement had been achieved. On both interventions tutors were scored on six critical behaviors and could earn 0-2 points on each behavior for 12 total points possible (see Table 11).

Table 11

Fidelity Data by Intervention

Intervention	<i>M</i>	<i>SD</i>
Sound Effects		
Tutor reminds student to say rime card first and then read the whole word.	1.17	0.97
Tutor's pace is fast and consistent throughout lesson.	1.22	0.79
Tutor prompts the student with the vowel sound when the student is struggling.	0.43	0.58
Tutor ensures that both students read all words in parts 2 and 3.	1.96	0.21
Tutor uses visual clues to cue students.	0.48	0.59
Tutor awards points.	2.00	0.00
Corrective		
Tutor follows script in teacher's presentation book.	1.89	0.41
Tutor's pace is fast and consistent throughout lesson.	1.82	0.39
Tutor uses signal immediately after speaking to cue student.	1.75	0.44
Tutor correctly follows correction procedure.	1.54	0.57
Tutor's transition time between exercises is brief.	1.82	0.39
Tutor correctly awards points.	2.00	0.00

Sound Effects tutors achieved 67% of the possible points for critical behaviors on average, while Corrective tutors earned 92% of the possible fidelity points. Sound Effects tutors performed the lowest on items three ("Tutor prompts the student with the vowel sound when the student is struggling," $M = .43$) and five ("Tutor uses visual clue to cue," $M = .48$). Corrective tutors performed lowest on item four ("Tutor correctly follows correction procedure," $M = 1.54$).

CHAPTER VI

DISCUSSION

The purpose of these studies was to: validate the use of color as cue for vowel pronunciation (multiple-baseline study) and test the effects of Sound Effects on the reading and spelling skills of struggling adolescents (comparison group study). Sound Effects was contrasted with Corrective Reading, a phonemic decoding program, and a no-treatment control group. Outcomes were measured on a set of word reading variables and spelling variables. The word reading measures included the Test of Word Reading Efficiency-phonemic decoding subtest (TOWRE), the Test of Silent Word Reading Fluency (TOSWRF), and oral reading fluency (ORF). The spelling measures included the Wide Range Achievement Test-Spelling subtest (WRAT), the Spelling Sensitivity Score-Elements (SSS-E), and the Spelling Sensitivity Score-Words (SSS-W). In addition, students' reading self-concept was measured before and after instruction. Finally, data was collected to assess students' satisfaction with their assigned intervention.

The findings provide a somewhat inconsistent picture of the utility of the Sound Effects intervention for improving the word reading skills of adolescent struggling readers. The intervention study did not reveal a differential effect for color-coding over more traditional subsyllabic instruction, whereas the multiple-baseline study indicated that color-coding rimes produced large effect sizes. Nonetheless, there are several significant conclusions that can be drawn from the evidence presented here.

First, the findings from the multiple-baseline study support the use of color-coding to scaffold the correct identification of vowel sounds in rime units. These results

add to Hines' findings (2009) and suggest that color cueing may be useful to adolescents as well as younger children. The color-cueing provided a meaningful support for reading disabled students as they attempted to accurately read the rime units in this study. It is important to note that the color support did not result in increased speed of rime reading. Instead, two of the students were noticeably slowed in their identification of rime units when the color-coding was introduced, which suggests that the color support may initially reduce speeded naming of vowel sounds while it reduces the errors of vowel sound identification. Finally, as has been exhibited in previous studies, the use of mnemonics or memory devices aid students with learning disabilities with encoding and retrieving information (Mastropieri, Scruggs, & Levin, 1985; Wolgemuth, et al., 2008).

Second, students in both Sound Effects and Corrective Reading did not make significant gains on any of the word reading variables after 15 sessions of small group instruction. It is well acknowledged that adolescent readers who are performing several years below their peers need a considerable amount of instructional time (Torgesen, et al., 2003). In fact, Torgesen et al. suggested that 60 hours of intervention might be needed to meaningfully improve the reading skills of students performing near the 30th percentile and 100 hours may be required for students reading at the 10th percentile. An examination of the marginal means by intervention groups on both non-word reading (TOWRE) and word reading fluency (TOSWRF) revealed growth in the expected direction, but these changes were not substantial enough and the sample large not big enough to be statistically significant. This suggests that, in spite of the color-coded medial vowel support provided by Sound Effects, 15 lessons was not enough time to

produce statistically significant growth for students reading at and below the 30th percentile on the TOSWRF.

Third, both Sound Effects and Corrective participants experienced significant growth on the Spelling Sensitivity Score metrics (SSS-E and SSS-W). The spelling measure consisted of 30 words, primarily single syllable words, from the pretest that were re-administered at post testing. The two metrics were used to analyze spelling growth on these words. The SSS-E metric considers how well students represent *word elements*, which consist of phonemes, juncture changes (e.g., dropping an *e* and adding *-ing*), and affixes. Points for the elements range from 0-3. Zero points are awarded if the student omits the element altogether. One point is awarded for an implausible spelling of an element. Elements that are spelled incorrectly, but are phonetically legal are awarded 2 points. Correct representations of elements are worth 3 points. For this population of students, there were limited words with juncture changes and affixes. As a result, most of the points for the SSS-E were awarded on the basis of students' ability to represent phonemes. Interestingly, the control group also exhibited smaller, but significant gains on the SSS-E. This may indicate that middle school students improve in their ability to represent phonemes as a result of on-going schooling. In fact, some research has suggested that phonemic awareness performance reaches its peak around the middle school years (Scarborough, Ehri, Olson, & Fowler, 1998). It is possible that the SSS-E reflects this expected growth. Both intervention groups also demonstrated significant gains on the SSS-W measure, which is scored similar to the SSS-E. In this case, the SSS-W is a somewhat more global index of spelling than the SSS-E. A SSS-W score of close to 3 suggests that the students' overall spellings are legal and correct, whereas a score

near 2 indicates that the student is having difficulty using conventional spellings. A score near 1 suggests that the student is experiencing difficulty representing all sounds with letters. The control group did not exhibit growth on this measure from pre to post testing, whereas both intervention groups achieved significant growth on this measure over the course of tutoring.

Overall, the spelling growth on both of the SSS metrics corroborate Lovett and Steinbach's findings (1997), which suggest that rimes and phonemes may both be useful subsyllabic instructional units for improving the skills of older students. The lack of gains on the WRAT-Spelling subtest suggests that the SSS metrics were more sensitive to growth than more traditional spelling measures. This finding is in keeping with recent literature, which has suggested that scoring spelling tests according to changes in phoneme representations (in this case, word elements) is a better indicator of growth than most standardized spelling measures (Masterson & Apel, 2010a, 2010b).

Fourth, students were only provided with brief instruction, but this time allotment was still enough to manifest changes in students' attitudes towards reading. The Reading Self-Concept attitude scale asks students questions such as, "Do you like reading to yourself?" and "Are you interested in reading?" The reading attitudes of students in the Corrective Reading intervention significantly decreased after 15 tutoring sessions. The Corrective intervention has several design features that are intended to foster student motivation, such as a placement test to ensure an appropriate level of difficulty, a point system, and daily charting of fluency data (Engelmann, et al., 2008b). Given the dearth of available literature for reading programs that have been examined in terms of student motivation, it is unclear if this finding is reflective of a genuine effect or is a spurious

finding. Students in the Sound Effects program did not exhibit changes on self-concept at post testing.

Fifth, these findings provide initial evidence for the social acceptability of Sound Effects among adolescent readers. All of the students were tutored in the same library space. Though students in both interventions did not experience the instruction provided through the other program, all students could observe the other intervention during instructional time. At the end of instruction, the two groups of students receiving the reading interventions were asked which program they would prefer to continue with: Sound Effects, Corrective, or Voyager. All but two of the fifteen students in the Sound Effects intervention indicated that they would choose to participate in Sound Effects over Corrective Reading or Voyager. The two remaining students selected Voyager and no one chose to participate in Corrective. Half of the students who received instruction in Corrective indicated that they would prefer to receive instruction in Sound Effects to both Corrective Reading and Voyager. During the fidelity reviews, which required listening to the tutoring sessions in real time, more than one Corrective student remarked to their tutor, “Why don’t we play games like the students in the other program?” (This was the comment of a student when observing the students in the Sound Effects intervention participating in various card games to practice skills being taught.). It is possible that embedding the card game instruction within Sound Effects may have increased the social acceptability of this approach. Whatever the reason for their selection of Sound Effects as their intervention of choice, students in this study found Sound Effects more acceptable than both Voyager and Corrective.

Future Research

This study was an initial attempt to examine the effects of the Sound Effects intervention; additional research is needed to expand upon the findings provided here. First, this study used brief normed measures of word reading efficiency in order to minimize the time that students were removed from their content area classes. For example, all of the word-reading measures were timed (TOWRE, 45 seconds; TOSWRF, 3 minutes; and ORF, 1 minute for each reading). As a result, all of the measures assessed fluency, which is a particularly intractable skill to remediate among students reading below the 30th percentile (Torgesen, et al., 2003). Future research of Sound Effects should include more traditional phonological measures (e.g., rime reading, phoneme blending), as well as untimed normed reading measures (e.g., WJ-Word Attack, WRAT-Word Recognition). The additional of these measures would provide a more complete picture of Sound Effect's impact on reading disabilities.

Second, a study design that provides students with additional instructional time in the Sound Effects intervention may allow for a more complete examination of the program's effectiveness. Although tutoring was provided two days weekly for a total of 15 sessions, most lessons were approximately 35 minutes across both interventions, which means that students only received an average of 8.75 hours of instruction in both Sound Effects and Corrective. It was hypothesized that the color would provide a meaningful scaffold that may allow for reduced subsyllabic instructional time and meaningful gains (as had occurred in clinical settings). As implemented, Sound Effects did not result in significant increases in word reading. When compared to the number of

hours provided to students in the studies reviewed in Chapter 2, it is apparent that future research should increase the number of instructional hours that students receive.

Finally, the findings of Calhoon, Sandow, and Hunter (2010) suggest that intensive interventions for adolescent struggling readers should be first focused on improving subsyllabic skills before attempting to add in fluency and comprehension instruction. Sound Effects was intended to be one component of an intensive reading curriculum that automatized word reading prior to adding other language instruction. Future research could replicate the instructional design recommended by Calhoon, Sandow, and Hunter and test the effectiveness of pairing Sound Effects instruction with other evidence-based interventions (e.g., cognitive strategy instruction).

Limitations

The outcomes from the fidelity of implementation reviews suggest that Sound Effects tutors experienced difficulty with implementing the most essential elements of the program (scaffolding vowel pronunciations with visual cues). This may be due to the lack of teacher scripting in the Sound Effects program. Unlike Corrective, Sound Effects lessons did not have scripted responses to student mistakes. Correcting student errors caused Sound Effects tutors the greatest difficulty. This difficulty with implementing unscripted interventions is consistent with the literature, which suggests that scripted programs are easier to follow and may allow for briefer training, whereas non-scripted programs require more professional judgment and, therefore, additional professional development (Denton, Vaughn, & Fletcher, 2003).

Given the lack of adherence to the core tenets of the intervention, it is difficult to draw conclusions about the effectiveness of South Effects over the course of tutoring.

Had the tutors been better equipped to scaffold vowel pronunciations, the participants may have experienced more meaningful practice opportunities across the 15 tutoring sessions.

Another limitation relates to the additional instruction that nearly half of the students were receiving during the school day. Twenty-four of the 47 subjects received daily Voyager instruction. Though Voyager is more heavily focused on teaching vocabulary and reading comprehension (Florida Center for Reading Research, 2005), it is still working on the same global skill (reading) and provides students with additional instruction that they would not have had otherwise. Though efforts were made to randomize Voyager students across conditions, the influence of this instruction could not be entirely controlled for.

The multiple-baseline study indicated that the color resulted in a meaningful cue for vowel pronunciation and reduced rime reading errors for the three students in the study. Still, the design did not remove the color treatment and systematically return color to a later phase in order to provide evidence of a systematic effect. Instead, the study was an *add-in design* (Ward-Horner & Sturmey, 2010). The color support was added to phase two, but it was never removed. Though a removal design provides stronger evidence than an add-in design, skills like reading are difficult to unlearn or remove. Thus, an add-in design was used for this particular study despite its limitations.

Finally, instructional time was a considerable limitation in the present study. After only nine hours of instruction, it was very difficult to assess changes in phonological skills among adolescents with word reading difficulties. Though an experienced practitioner may have been able to improve student reading in this limited

amount of time, the tutors in the study were unable to implement Sound Effects as intended, making data interpretation challenging.

Implications for Policy

Delivering meaningful instruction to students who are significantly below grade level has been an on-going policy debate (Fielding, Kerr, & Rosier, 2007). A potential solution has been to offer on-going instruction during after school hours (Moje & Tysvaer, 2010). In the present study, the school district had a highly structured after school program. Students were provided with snacks, teacher support, and a bus ride home everyday. If students were behind on homework assignments, staff could request that they remain after school. In terms of using the after school program to provide additional intensive reading instruction for struggling adolescent readers, it was very difficult to ensure attendance even with numerous incentives in place. Overall, the 15 students in Sound Effects missed a total of 24 lessons, while 16 Corrective students missed a total of 30 lessons. Three students missed (and made up) more than half of their instructional sessions. For adolescent readers who have experienced failure in reading, staying after school may have been a less-than-appealing option. It may be the case that intensive reading intervention for the students with the greatest needs is best delivered during the school day.

Another important implication is related to the personnel providing subsyllabic support. In this study, work-study students from a selective private liberal arts university provided the instruction to participants. None of the tutors were education majors, but several expressed interest in teaching after completing their undergraduate degree via an alternative-route teacher preparation program. Despite their enthusiasm, the Sound

Effects tutors struggled to implement this intervention, unlike the Corrective tutors who more closely adhered to the fidelity of the program. The Sound Effects program was intended to allow for flexibility, as scripting instruction may limit the potency of an intervention by narrowing its instructional pliancy. However, for the purpose of conducting this study, a set of 15 Sound Effects lessons were designed that were directive, although not scripted. Nonetheless, the tutors struggled to adhere to the intent of the program without very specific scripting, especially as it related to correcting student errors. This was true in both interventions, despite the fact that Corrective includes specific correction procedures (errors that were committed by tutors were on the correction procedure). Arguably, some control was sacrificed in the implementation of Sound Effects by not scripting it more tightly. On the other hand, Gersten (2005) has suggested that high quality experimental research does not require scripted curricula. Instead, he has suggested that flexibility can exist within research interventions. However, Gersten indicates that this flexibility is possible when experienced teachers partner with researchers. It may be the case that achieving significant outcomes for adolescents reading several years below grade level is more likely when the implementing instructors are experienced teachers who are better equipped to interact with unscripted materials.

Summary

The findings presented here suggest that the Sound Effects intervention is an effective tool for reducing errors in vowel pronunciations and increasing spelling skills. In terms of word reading, the data in this study did not indicate growth on word reading after 15 lessons. Additional research with increased instructional time will be required to

investigate the effects of Sound Effects on word reading variables. Increasing the word reading skills of struggling adolescent readers continues to be an instructional challenge for practitioners and researchers alike. Secondary students with reading disabilities need to be exposed to the same content-area courses as their peers, yet their reading skills often inhibit their capacity to cope in reading-intensive environments. The solution for how to best structure intensive word reading interventions for adolescents while balancing other curricular demands remains unresolved and urgent.

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Appendix A

Sound Effects Rime Cards (front and back)

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bet, get, let, jet, met, net, pet, set, vet, wet, yet, (<i>debt</i>) fret, whet	less, mess, yes, (<i>guess</i>) bless, chess, dress, press, tress, stress	bell, cell, dell, fell, jell, sell, tell, well, yell dwell, quell, shell, smell, spell, swell	and, band, hand, land, sand bland, brand, gland, grand, stand strand	at, bat, cat, fat, hat, mat, pat, rat, sat, tat, vat, (<i>gnat</i>) brat, blat, chat, flat, plat, scat, slat, spat, that	bed, fed, led, red, wed, zed bred, bled, fled, shed, pled, sped, shred
bun, dun, fun, gun, nun, pun, run, sun shun, spun, stun	bum, gum, hum, mum, rum, sum (<i>dumb</i> , <i>numb</i> , <i>crumb</i> , <i>thumb</i>) (<i>plumb</i>) chum, drum, glum, plum, scum, slum, strum	bug, dug, hug, jug, lug, mug, pug, rug, tug chug, drug, plug slug, smug, snug thug, shrug	buff, cuff, huff, muff, puff, ruff bluff, fluff, gruff, scuff, snuff, stuff, scruff	cub, dub, hub, nub, pub, rub, sub, tub chub, club, drub, flub, grub, snub, stub scrub	but, cut, gut, hut, jut, nut, rut (<i>butt</i> , <i>mutt</i> , <i>putt</i>) glut, shut strut

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ill, bill, dill, fill gill, hill, kill, mill, nil, pill, rill, sill, till, will chill, drill, frill, grill, quill, skill, spill, still, trill, twill, shrill, thrill		ding, king, ping, ring, sing, wing, zing bling, bring, cling, fling, sling, sting, swing, thing, string, spring	big, dig, fig, gig, jig, pig, rig, wig, zig brig, prig, swig, twig, sprig	bid, did, hid, kid, lid, mid, rid grid, quid, skid, slid, squid	den, fen, hen, men, pen, ten, when glen, then
beer, deer, jeer, leer, peer, seer, veer cheer, sheer, sneer, steer	beet, feet, meet fleet, greet, sheet, skeet, sleet, sweet, tweet, street	it, bit, fit, hit, kit, lit, mitt, pit, sit, wit, zit, (knit), chit, flit, grit, quit, skit, slit, snit, spit, twit, split	dip, hip, jip, lip, nip, pip, rip, sip, tip, zip, whip blip, chip, clip, drip, flip, grip, quip, ship, skip, slip, snip, trip, scrip, strip	in, bin, din, fin, gin, kin, pin, sin, tin, win chin, grin, shin, skin, spin, thin, twin	dim, him, rim, vim, whim, (limb) brim, grim, prim, shim, skim, slim, trim, scrim

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ate, date, fate gate, hate, late, mate, rate, sate crate, grate, plate, slate, spate, state	eel, feel, heel, keel, peel, reel, wheel, (kneel) steel	eek, geek, leek, meek, peek, reek, seek, week cheek, creek, sleek	deed, feed, heed, need, reed, seed, weed bleed, creed, freed, greed, speed, steed	keen, seen, teen green, preen, queen, sheen, screen, spleen	bee, fee, gee, see, tee, wee, (knee) (be, he, me, we, she) flee, free, glee, thee, tree spree, three
beep, deep, jeep, keep, peep, seep, weep bleep, cheep, creep, sheep, sleep, steep, sweep	bide, hide, ride, side, tide, wide bride, chide, glide, pride, slide, snide pride stride	by, my (bye, eye, dye, lye, rye) cry, dry, fly, fry, ply, pry, shy, sky, sly, spy, sty, try, why spry	dime, lime, mime, rime, time chime, crime, grime, prime, slime	bike, dike, hike, like, mike, pike spike strike ,	bane, cane, lane, mane, pane, sane, vane, wane crane, plane,

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bode, code, mode, node, rode strode	cope, dope, hope, lope, mope, pope, rope grope, scope, slope	go, lo, no, so, pro, (toe, hoe, foe)	dote, mote, note, rote, tote, vote quote, wrote	coke, joke poke, woke broke, choke, smoke, spoke, stoke, stroke	dine, fine, line, mine, nine, pine, tine, vine, wine, (whine) brine, shine, spine, twine, shrine
		pipe, ripe, wipe (hype, type) gripe, snipe, swipe, tripe, stripe	bile, file, mile, pile, rile, tile, vile, wile, while smile, stile, (style)	bow, low, mow, row, sow, tow blow, flow, glow, grow, show, slow, snow, stow, throw	boot, hoot, loot, moot, root, toot scoot, shoot, snoot
coop, goop, hoop, loop, whoop droop, scoop, sloop, snoop, stoop, troop	boon, goon, loon, moon, soon croon, spoon, swoon	boom, doom loom, room zoom bloom broom, gloom, groom	cool, fool, pool, tool drool, spool stool school	goof, hoof poof, roof, woof proof, spoof	boo, coo, goo, moo, too, woo, zoo shoo

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end, bend, fend lend, mend, rend, send, tend, vend, wend blend, spend, trend, (fr <i>i</i> end)	best, fest, jest, lest, nest, pest, rest, test, (<i>g</i> uest),(<i>w</i> rest) chest, quest	batch, catch, hatch, latch, match, patch snatch, thatch, scratch	bank, dank, hank, lank, rank, sank, tank, yank blank, clank, crank, drank, flank, frank, plank, prank, shank, spank, stank, thank shrank	bang, fang, gang, hang, pang, rang, sang, tang clang, slang, sprang	ant, cant, can't pant, rant chant, grant, plant, scant, slant
hung, lung, rung, sung, clung, flung, slung, stung sprung, strung	bump, dump, hump, jump lump, <u>pump</u> , rump chump, clump, frump, grump, plump, slump, stump, thump, trump	buck, duck, luck, muck, puck, suck, tuck chuck, cluck, pluck, shuck, snuck, stuck, truck, struck	gush, hush, lush, mush, rush blush, brush, crush, flush, plush, slush thrush	bust, dust, gust, just, lust, must, rust crust, trust. thrust	bunk, dunk, funk, gunk, hunk, junk, punk, sunk chunk, clunk, drunk, flunk, plunk, skunk, spunk, stunk, trunk, shrunk
bunch, hunch, lunch, munch, punch brunch, crunch	budge, fudge, judge, nudge, pudge drudge, grudge, sludge, smudge, trudge	edge, hedge, ledge, sedge, wedge dredge, pledge, sledge	cock, dock, hock, jock, lock, mock, pock, rock, sock, tock, (<i>k</i> nock), (<i>w</i> ok) block, <u>chock</u> , clock, crook, flock, frock, shock, smock, stock	bong, gong, long, song, tong, (<i>w</i> rong) prong strong, throng	beck, deck, heck, neck, peck (<i>t</i> rek), (<i>w</i> reck) check, fleck, speck

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ash, bash, cash, dash, gash, hash, lash, mash rash, sash, (gnash) brash, <u>cl</u> ash, crash, flash, slash, smash, stash, trash splash, thrash	camp, damp, lamp, ramp, tamp, vamp champ, clamp, cramp, stamp, tramp	back, hack, jack, lack, pack, rack, sack, tack whack, (<u>kn</u> ack) black, <u>cl</u> ack, crack, flack, quack, shack, slack, smack, snack, stack, track	ink, dink, fink, kink, link, mink, pink, rink, sink, wink blink, brink, chink, clink, drink, slink, stink, think, shrink	itch, ditch, glitch, hitch, pitch, witch (rich), (which) glitch, snitch, stitch, switch, twitch	hick, kick, lick, nick, pick, sick, tick, wick —— brick, chick, click, flick, quick, trick, slick, stick, thick
aid, laid, maid, paid, raid braid, staid	gain, lain, main, pain, rain, vain brain, chain, drain, grain, plain, slain, stain, swain, train sprain, strain	bare, care, dare, fare, hare, mare, pare, rare, ware blare, flare, glare, scare, share, snare, spare, stare square	cave, gave, pave, rave, save, wave, (<u>kn</u> ave) brave, crave, grave, shave, slave, stave	face, lace, mace, pace, race (base, case, vase chase) brace, grace, place, space, trace	bane, cane, lane, mane, pane, sane, vane, wane crane, plane
ear, dear, fear, gear, hear, near, rear, sear, tear clear, shear, smear, spear	deal, heal, meal, peal, real, seal, teal, veal, zeal steal, squeal	beak, leak, peak, teak, weak bleak, creak, freak, sneak, speak, squeak, streak	each, beach, leach, peach, reach, teach bleach, breach, preach	ail, bail, fail, hail, jail, mail nail, pail, rail, sail, tail, wail frail, grail, quail, snail, trail	air, fair, hair, lair, pair chair, flair, stair


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<p>dire, fire, hire, mire, sire, tire, wire (lyre, pyre)</p> <p>quire, shire, spire, squire</p>	<p>ice, dice, lice, mice, nice, rice, vice</p> <p>price, slice, spice, twice, splice</p>	<p>fight, light, might, night, right, sight, tight</p> <p>blight, bright, fright, flight, plight, slight (height)</p>	<p>eat, beat, feat, heat, meat, neat, peat, seat, wheat</p> <p>bleat, cheat, cleat, treat</p>	<p>beam, ream, seam, team</p> <p>cream, dream, gleam, steam scream, stream</p>	<p>bean, dean, lean, mean, wean, (jeans)</p> <p>clean, glean</p>
<p>hose, nose, pose, rose (dose)</p> <p>chose, close, prose, those, (close)</p>	<p>dole, hole, mole, pole, role, sole, vole, whole</p> <p>stole</p>	<p>ore, bore, core, fore, gore, lore, more, pore, sore, tore, wore</p> <p>chore, score, shore, snore, spore, store, swore</p>	<p>bone, cone, hone lone, pone, tone, zone</p> <p>clone, crone, drone, phone, prone, scone, shone, stone, throne</p>	<p>bite, kite, mite, rite, site, white</p> <p>quite, smite, spite, trite sprite</p>	<p>dive, five, hive, jive, live (wives)</p> <p>chive, drive, strive, thrive</p>
	<p>cure, lure, pure, sure</p>	<p>cue, due, hue, rue, sue</p> <p>blue, clue, flue, glue, true queue</p>	<p>dew, few, hew, mew, new, pew, whew, (view)</p> <p>blew, brew, chew crew, drew, flew, grew, spew, slew stew, screw, strew, threw</p>	<p>cute, jute, lute, mute</p> <p>brute, chute, flute</p>	<p>oat, boat, coat, goat, moat</p> <p>bloat, float, gloat, shoat throat</p>

Appendix B

Sample Sound Effects Lesson

Lesson 10

Center for Research on Learning

Focus On: Two-syllable Words & Dotting

Warm-up
2 minutes

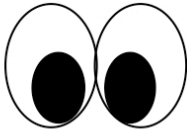
Sort and Say (not timed): Using the card backs, sort all cards (basic and *) onto the board.

Part 1
Rhyming & Making Words
10 minutes (top or bottom)

Student 1 ose, ash, ice

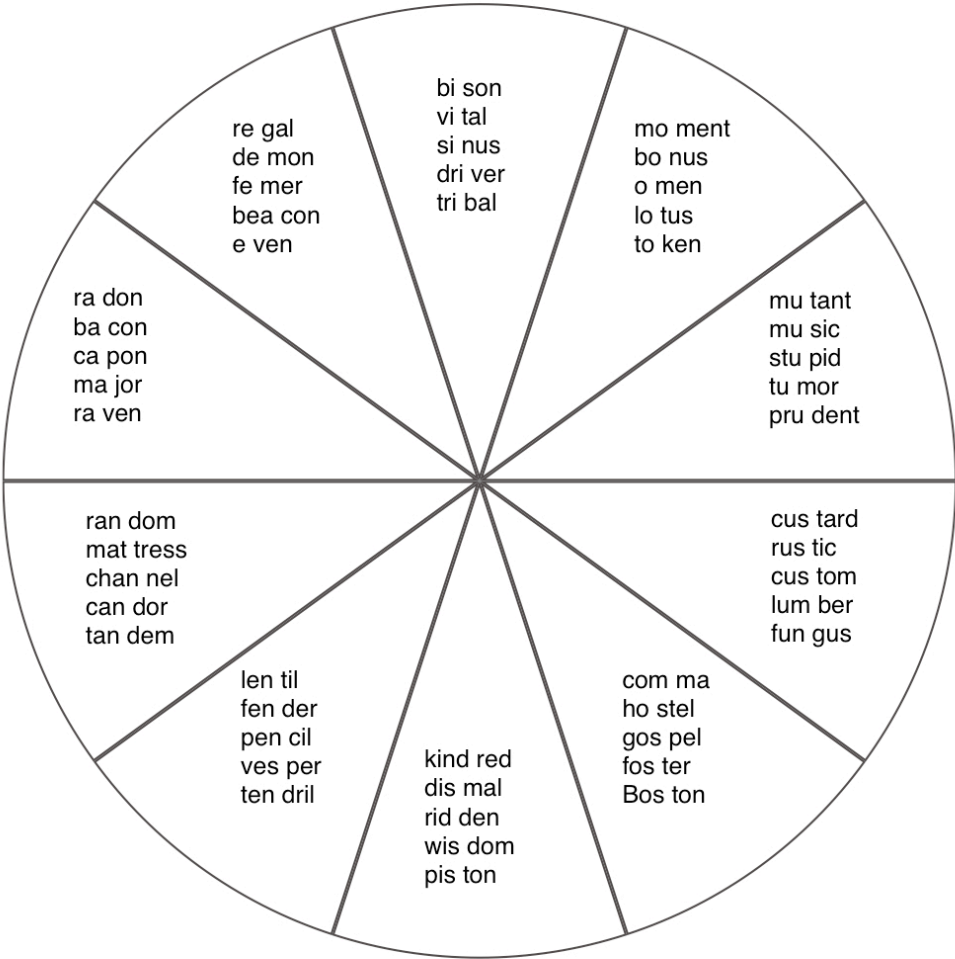
Student 2 ase, oose, ush

Part 2
Reading & Spelling
10 minutes



Look!

Every syllable has a vowel - these words have been divided into syllables. Practice dotting the vowels as you read.



Spelling List

Read Down, Spell Across	Long	taper reason ripen token ruler	brazen steamer fiber poker ruder	stamen peanut trident moment student
	Short	pattern settler snippet blotter sudden	scamper blender whisper somber bluster	rampart restless listless fondness plunder

Part 3

Phrases &
Sentences
5 minutes

Phrases to Read

random sample	a single moment	mutant turtle
a vital signal	a driver's license	a broken piston
a feeble raven	a broken mattress	a pungent odor
an evil omen	a prudent student	a blatant trumpet

Sentences to Read

We suffered from lack of sleep with our broken mattress.

You will need your driver's license to cash that bonus check.

I like tandem bikes better than riding solo.

After the bible reading there was ample gospel music.

I love frozen custard on a hot, humid day.

Many believe in evil omens, but others think they are stupid.

Do people from Boston have a local accent?

Game
15 minutes

Round the Board: Students take turns with basic tan going 'round the board' to make words.

Appendix C

Sound Effects Rhyme Chart

b	c	d	f	g	h
j	k	l	m	n	p
r	s	t	v	w	z

y	sh	ch	cr	st	sm
fr	br	pr	gr	sp	sn
cr	cl	wh	th	tr	dr

Appendix D

Corrective Sample Lesson B1 and B2

WORD-ATTACK SKILLS

Board Work

EXERCISE 1

INTERNAL VOWEL CONVERSIONS: ea, oa

1. (Print in a column on the board:)

rear
leaf
mean
ears

2. (Point to **rear**. Pause.) What word?
(Signal.) *Rear*.
 - (Repeat for **leaf**, **mean**, **ears**.)
3. (Replace **ea** with **oa** in each word:)

roar
loaf
moan
oars

4. (Point to **roar**. Pause.) What word?
(Signal.) *Roar*.
 - (Repeat for **loaf**, **moan**, **oars**.)
5. (Change the list to:)

rear
loaf
mean
ears

6. (Point to **rear**. Pause.) What word?
(Signal.) *Rear*.
 - (Repeat for **loaf**, **mean**, **ears**.)
7. (Change to the original list:)

rear
leaf
mean
ears

- (Repeat steps 2–6 until firm.)

Individual test

(Repeat steps 1–6, calling on individual students to read all the words in the column.)

Student Book



EXERCISE 2

WORD READING WITH UNDERLINED PART

1. Open your Student Book to Lesson 26. ✓

1

ranch faster chopped
goats checked horses
bent slap leave heels
loafers swam swim jab

- Touch part 1. ✓
 - You're going to say the sound for the underlined part and then read the word.
2. First word. ✓
 - What sound? (Signal.) *ch*.
 - What word? (Signal.) *Ranch*.
 3. Next word. ✓
 - What sound? (Signal.) *er*.
 - What word? (Signal.) *Faster*.
 4. (Repeat step 3 for each remaining word.)
 5. (Repeat steps 2–4 until firm.)

EXERCISE 3

WORD READING

1. Touch the first word in part 2. ✓

2

rode named rider safe
makes side tame time

2. What word? (Signal.) *Rode*.
3. Next word. ✓
 - What word? (Signal.) *Named*.
4. (Repeat step 3 for each remaining word.)

EXERCISE 4

WORD READING

Task A Irregular words

1. Touch the first word in part 3. ✓

3

Emma anyone nobody good
because let's boss didn't
ready their Flop woman
women milked herself station
question biggest stayed Branch

2. That word is **Emma**. What word?
(Signal.) *Emma*.
 - Spell **Emma**. (Signal for each letter.)
E-M-M-A.
 - What word? (Signal.) *Emma*.
3. The next word is **anyone**. What word?
(Signal.) *Anyone*.
 - Spell **anyone**. (Signal for each letter.)
A-N-Y-O-N-E.
 - What word? (Signal.) *Anyone*.
4. The next word is **nobody**. What word?
(Signal.) *Nobody*.
 - Spell **nobody**. (Signal for each letter.)
N-O-B-O-D-Y.
 - What word? (Signal.) *Nobody*.
5. The next word is **good**. What word?
(Signal.) *Good*.
 - Spell **good**. (Signal for each letter.)
G-O-O-D.
 - What word? (Signal.) *Good*.

Task B

1. Go back to the first word. ✓
 - What word? (Signal.) *Emma*.
2. Next word. ✓
 - What word? (Signal.) *Anyone*.
3. (Repeat step 2 for each remaining word.)

EXERCISE 5

WORD-ATTACK SKILLS: Individual tests

1. (Call on individual students. Each student reads a row. Tally the rows read without error. If the group reads at least 9 rows without making errors, direct all students to record 4 points in Box A of their Point Chart. Criterion is 80 percent of rows read without error.)
2. (If the group did not read at least 9 rows without errors, do not award any points for the Word-Attack Skills exercises.)

GROUP READING

EXERCISE 6

STORY READING

1. Everybody, touch part 4. ✓
2. After you read each part without making more than 3 errors, I'll ask questions about that part.

4

The Rancher

3. (Call on a student to read the title.)
The Rancher.
 - What do you think this story is about? (Accept reasonable responses.)
4. (Use the following procedures for each part of the story.)
 - a. (Call on individual students. Each is to read one or two sentences. Praise students who read without making errors.)
 - b. (At the end of the part, tell the students the number of errors the group made and whether the group earned points for that part.)
 - c. (If the group made more than 3 errors, direct the group to reread the part.)
 - d. (After the group reads a part with no more than 3 errors, call on individual students to answer the comprehension questions for that part.)

There was a big ranch in the West. The rancher who ran this ranch was named Emma Branch. She rode a horse well. She chopped fast, and she swam faster. The men and women who worked for Emma Branch liked her. They said, "She is the best in the West." On her ranch she had sheep, and she had cows. There were goats and horses. There was a lot of grass.

The rancher had a lot of women and men working for her. They worked with the sheep and the goats, and they milked the cows. Each worker had a horse. But the rancher's horse was the biggest and the best. It was a big, black horse named Flop.

[1]

First-part questions:

- What was the name of the rancher?
Emma Branch.
- Name some things she did well. (Ideas: *Rode a horse well, chopped fast, swam faster.*)
- What kind of animals did she have on her ranch? (Idea: *Sheep, cows, goats, horses.*)
- Who had the biggest horse? (Ideas: *The rancher; Emma Branch.*)
- What was its name? *Flop.*

Flop got its name because it reared up. When Flop reared up, any rider on it fell down and went "flop" in the grass. But Flop did not rear up when the rancher rode it. Emma Branch bent near Flop's ear and said, "Let's go, Flop." And they went. She did not have to slap the horse. She didn't have to jab her heels and yell at Flop. She just said, "Let's go," and they went like a shot.

Every day, she checked up on the workers to see what they were doing. She checked to see that they were working well and that they were not loafing.

[1]

Second-part questions:

- Why did Flop have the name Flop? (Idea: *When anyone tried to ride Flop, Flop reared up and the rider went "flop" in the grass.*)
- Did Flop give Emma a hard time? *No.*
- What did Emma do every day? (Idea: *Checked on the workers.*)

If a worker was loafing, Emma told the worker, "I will say this for the last time: 'Do not loaf on this ranch any more.' " If a worker was loafing the next time she checked, she said, "Go from my ranch. We do not need loafers here."

The women and men who worked on the ranch said, "When you hear Flop running, you had better be working. If you are not working, you had better get ready to leave this ranch."

But the workers that stayed at the ranch liked to work for Emma Branch. They said, "We like to have Emma on our side. We can see how mean Flop is, and he is very tame when Emma rides him. So it's good to have Emma on your side."

[2]

Third-part questions:

- What would Emma do if she found a worker loafing for the first time? (Idea: *Tell the worker not to loaf on the ranch anymore.*)
 - What would she do the next time? (Idea: *Tell the worker to leave the ranch.*)
 - Why did the workers think it was good to have Emma on their side? (Accept reasonable responses.)
5. (After the group has completed reading the story and answering the comprehension questions, tell the students the total number of points to record in Box B of their Point Chart. Maximum = 4 points.)

FLUENCY ASSESSMENT

EXERCISE 7

NEW READING CHECKOUTS

Note: The rate criterion for Lessons 26–30 is 70 words per minute.

1. (For this part of the lesson, assigned pairs of students work together during the checkouts.)
2. (Each student does two checkouts.)
 - (First checkout: Students can earn 3 points by making no more than 2 errors on the first part of story 26. Students record points in Box C-1 of their Point Chart.)
 - (Second checkout: 1-minute timed reading. Students can earn 3 points by reading at least **70 words** and making no more than 3 errors on the first part of story 25. Students record points in Box C-2 of their Point Chart.)
3. (During each checkout, observe at least two pairs of students. Make notes on mistakes. Give checkers feedback.)
4. (Direct all students to plot their reading rate—the number of words they read in 1 minute—on the Individual Reading Progress Chart at the end of their Workbook.)
 - (Next, direct students to circle the number of errors they made during the timed reading.)
5. (Record on the Fluency Assessment Summary form the timed reading checkout performance for each student you observed.)

WORKBOOK EXERCISES

Workbook: Teacher Directed

EXERCISE 8

WRITING LETTERS FOR SOUNDS

1. Open your Workbook to Lesson 26. ✓
 - Find part 1. ✓
 - You're going to write the letter or letters for each sound that I say.
2. First sound: **er**. What sound? (Signal.) *er*.
 - Write it.
3. Next sound: **or**. What sound? (Signal.) *or*.
 - Write it.
4. (Repeat step 3 for **īīī, sss, fff, b, āāā, ēēē, ōōō, p**.)

Individual test

(Call on a student.) Read the letters you wrote, starting with the first blank.

1 er or i s f
b a e o p

2 The words in the first column have endings. Write the same words without endings in the second column.

patted	slip
conning	pat
slipper	con

3 Write the answers to these questions:

- What was the name of the rancher? Emma Branch
- Name 2 things the rancher did well. (rode a horse well);
chopped fast; swam faster)
- Who had the biggest horse? (the rancher; Emma)
- What was the name of the horse? Flop
- What did the rancher do every day? (checked up on the workers)

4 Match the words and complete them.

slap	be ^{nt}
bent	swi ^m
leave	slap
swim	lea ^{ve}

5 Copy this sentence.
Each worker had a horse.
Each worker had a horse.

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Independent Student Work

- Complete all the other parts of your Workbook lesson. If you make no more than 4 errors, you earn 6 points.
- (After checking the Workbooks, direct students who made no more than 4 errors to record 6 points in Box D of their Point Chart.)

Point schedule for Lesson 26

Box	Lesson part	Points
A	Word Attack	0 or 4
B	Group Reading	0 to 4
C-1	1st Reading Checkout (not timed)	0 or 3
C-2	2nd Reading Checkout (timed)	0 or 3
D	Workbook	0 or 6
Bonus	(Teacher option)	—

END OF LESSON 26

EXERCISE 9

WRITING WORDS WITHOUT ENDINGS

- Find part 2. ✓
 - The words in the first column have endings.
- First word. ✓
 - What word? (Signal.) *Patted.*
- Next word. ✓
 - What word? (Signal.) *Conning.*
- (Repeat step 3 for **slipper**.)
- Later, you're going to write the same words without endings in the second column.

WORD-ATTACK SKILLS

Board Work

EXERCISE 1

ENDINGS BUILDUP

1. (Print in a column on the board:)

wash
spill
join

2. (Point to **wash**. Pause.) What word? (Signal.) *Wash*.
- (Repeat for **spill**, **join**.)
3. (Change the list to:)

washes
spills
join s

4. (Point to **washes**. Pause.) What word? (Signal.) *Washes*.
- (Repeat for **spills**, **joins**.)
5. (Change the list to:)

washed
spilled
joined

6. (Point to **washed**. Pause.) What word? (Signal.) *Washed*.
- (Repeat for **spilled**, **joined**.)
7. (Change the list to:)

washing
spilling
join ing

8. (Point to **washing**. Pause.) What word? (Signal.) *Washing*.
- (Repeat for **spilling**, **joining**.)

9. (Change to the original list:)

wash
spill
join

- (Repeat steps 2–8 until firm.)

Individual test

(Repeat steps 1–8, calling on individual students to read all the words in the column.)

Student Book



EXERCISE 2

WORD CONVERSIONS

1. Open your Student Book to Lesson 32. ✓

1

A	B	C	D	E
food	burn	benches	pointed	load
fold	barn	beaches	painted	loud

- Touch part 1. ✓
- 2. Touch the first word in column A. ✓
- What word? (Signal.) *Food*.
- 3. Next word. ✓
- What word? (Signal.) *Fold*.
- 4. (Repeat steps 2 and 3 for the words in columns B–E.)

EXERCISE 3

WORD READING

1. Touch the first word in part 2. ✓

2

soiled cooled eaten watched pounded

- What sound? (Signal.) *oy*.
- What word? (Signal.) *Soiled*.
- 2. Next word. ✓
- What sound? (Signal.) *oo*.
- What word? (Signal.) *Cooled*.
- 3. (Repeat step 2 for each remaining word.)

Lesson 32 197

Lesson 32

EXERCISE 4

WORD READING

1. Touch the first word in part 3. ✓

3

listened tests invisible copper
silver glass flatter visible
grime lazy removes relatives
freezer stomped floor stove
gallon realize shook

2. That word is **listened**. What word? (Signal.) *Listened*.
 - Spell **listened**. (Signal for each letter.) *L-I-S-T-E-N-E-D*.
 - What word? (Signal.) *Listened*.
3. Next word. ✓
 - What word? (Signal.) *Tests*.
4. (Repeat step 3 for each remaining word.)

EXERCISE 5

WORD-ATTACK SKILLS: Individual tests

1. (Call on individual students. Each student reads a row or column. Tally the rows and columns read without error. If the group reads at least 9 rows and columns without making errors, direct all students to record 4 points in Box A of their Point Chart. Criterion is 80 percent of rows and columns read without error.)
2. (If the group did not read at least 9 rows and columns without errors, do not award any points for the Word-Attack Skills exercises.)

GROUP READING

EXERCISE 6

STORY READING

1. (Call on individual students to answer these questions.)
 - Irma was trying to invent a particular kind of paint. What did she want that paint to do? (Idea: *Be super hard so that it would not wear out.*)
 - What kind of paint did she actually invent? (Idea: *Paint that makes things invisible.*)
 - What happened to make her think that the paint made things invisible? (Accept reasonable summaries.)
2. Everybody, touch part 4. ✓
3. After you read each part of the story without making more than 2 errors, I'll ask questions about that part.

4

Irma Tests the Invisible Paint

4. (Call on a student to read the title.) *Irma Tests the Invisible Paint*.
 - What do you think this story is about? (Accept reasonable responses.)
5. (Use the following procedures for each part of the story.)
 - a. (Call on individual students. Each is to read one or two sentences. Praise students who read without making errors.)
 - b. (At the end of the part, tell the students the number of errors the group made and whether the group earned points for that part.)
 - c. (If the group made more than 2 errors, direct the group to reread the part.)
 - d. (After the group reads a part with no more than 2 errors, call on individual students to answer the comprehension questions for that part.)

Irma had left a nail on the hard paint. When she came back to her lab, the nail was invisible. Slowly she began to realize that the paint had made the nail invisible.

She said to herself, "I will test that paint." She took a coin from her purse and dropped the coin on the paint. Then she watched and waited. After a while, she saw that the coin was starting to turn invisible. It now looked like a glass coin. She could still see it, but it did not look like a copper coin or a silver coin. It looked like a glass coin.

[1]

First-part questions:

- How did she test the paint? (Idea: *She dropped a coin on the paint.*)
- How did the appearance of the coin change after a while? (Idea: *It looked like a glass coin.*)

She dropped it on the floor. "Clink," it went. It sounded like a coin. She took a hammer and hit the coin ten times. She wanted to see what would happen to it now. The coin got flatter and bigger, but it still looked like glass. She said, "I don't believe what is happening."

She set the coin on the paint again and waited. Soon the coin was invisible. Now it didn't look like glass. It didn't look like anything.

"I don't believe it," Irma said to herself. She felt the coin. She could feel the dents that had been made by the hammer.

[1]

Second-part questions:

- How did the coin change when she hit it with a hammer? (Idea: *It became flatter and bigger.*)
- When she returned the coin to the paint, what happened to it? (Idea: *It became invisible.*)

Irma closed her eyes and picked up the coin. "It feels like it should feel," she said to herself. Then she opened her eyes and looked at the coin in her hand. It was invisible.

She said, "I must see how this invisible paint works." She got a pot of water and heated it on the stove in her lab. When the water began to boil, she dropped the coin into it. Then she watched to see what would happen.

Slowly she could see the coin begin to form at the bottom of the boiling water. Slowly it became visible. At first it looked like glass. Then it began to look like a coin that had been pounded with a hammer.

[1]

Third-part question:

- How did she make the coin reappear? (Idea: *She dropped the coin into boiling water.*)

Lesson 32

She lifted the coin from the boiling water and set it on a sheet of foil. When the coin had cooled, she picked it up and looked at it. She said, "I know that I can remove the invisible paint with boiling water. Now I will try something else."

She took a soiled rag and tore off a small bit. She set the bit of rag on the hard paint. Then she watched as the rag became invisible.

"Now I will see if something else will remove that invisible paint." She took the bit of soiled rag and dropped it in the washtub. Then she turned on the cold water and let it run over the rag.

[2]

Fourth-part questions:

- She found one way to make the invisible things visible again. What was that? (Idea: *To drop them in boiling water.*)
- She was going to test another way, so she made something else invisible. What was that? (Idea: *A bit of soiled rag.*)
- What did she do with the rag when it was invisible? (Idea: *Put it in the washtub and ran cold water on it.*)

The water washed away bits of grime. As each bit of grime left the rag, a spot became visible. But the rest of the rag was still invisible. "Cold water does not seem to work too well," Irma said.

Then she took a can of motor oil from the shelf. She filled a cup with oil and dropped the rag into the cup of oil. Slowly the rag became visible. Irma smiled. She said, "Oil removes the invisible paint."

Now Irma had to think. She could hardly believe what had happened. She went over everything five times. Then she shook her head and said, "It must have happened. I must have made a paint that turns things invisible."

[2]

Fifth-part questions:

- How did the water change the rag? (Idea: *Where it washed away bits of grime, spots became visible.*)
- What did she soak the rag in next? (Idea: *Motor oil.*)
- What happened to the rag? (Idea: *It became visible.*)

"Irma," Berta called from upstairs, "what happened to that gallon of ice cream that was in the freezer?"

Irma said, "If it's not in the freezer, you must have eaten it."

Berta yelled, "Well, why didn't you get more? How can we watch TV if we don't have ice cream?"

Irma said, "You'll just have to do the best you can."

Berta did not say anything. She stomped back to the living room. As Irma listened to her lazy boarder walking across the floor, she got an idea. She smiled and said to herself, "I think I can have a lot of fun with this invisible paint."

[1]

Sixth-part questions:

- What was Berta complaining about? (Idea: *She wanted ice cream.*)
- What was Irma thinking at the end of this story? (Idea: *That she could have fun with the paint.*)
- How could she have fun with that paint? (Accept reasonable responses.)
- (After the group has completed reading the story and answering the comprehension questions, tell the students the total number of points to record in Box B of their Point Chart. Maximum = 8 points.)

FLUENCY ASSESSMENT

EXERCISE 7

READING CHECKOUTS

1. (For this part of the lesson, assigned pairs of students work together during the checkouts.)
2. (Each student does two checkouts.)
 - (First checkout: Students can earn 2 points by making no more than 2 errors on the first part of story 32. Students record points in Box C-1 of their Point Chart.)
 - (Second checkout: 1-minute timed reading. Students can earn 2 points by reading at least 105 words and making no more than 3 errors on the first part of story 31. Students record points in Box C-2 of their Point Chart.)
3. (During each checkout, observe at least two pairs of students. Make notes on mistakes. Give checkers feedback.)
4. (Direct all students to plot their reading rate—the number of words they read in 1 minute—on the Individual Reading Progress Chart at the end of their Workbook.)
 - (Direct students to circle the number of errors they made during the timed reading.)
5. (Record on the Fluency Assessment Summary form the timed reading checkout performance for each student you observed.)

WORKBOOK EXERCISES

Independent Student Work

1. Open your Workbook to Lesson 32. ✓
 - Complete all parts of your Workbook lesson. If you make no more than 3 errors, you earn 4 points.
2. (After checking the Workbooks, direct students who made no more than 3 errors to record 4 points in Box D of their Point Chart.)

END OF LESSON 32

Lesson 32

1 Write 1, 2, or 3 in front of each sentence to show when these things happened in the story. Then write the sentences in the blanks.

1. Irma took a coin from her purse and dropped the coin on the paint.

3. Irma dropped the coin in the boiling water.

2. The coin became invisible.

1. Irma took a coin from her purse and dropped the coin on the paint.

2. The coin became invisible.

3. Irma dropped the coin in the boiling water.

2 Write the answers to these questions:

1. What happened to the coin when Irma hit it with a hammer? (It got flatter and bigger.)

2. How did Irma make the rag become visible again? (by soaking it in motor oil)

3. What did Berta want? (ice cream)

4. What was Irma thinking at the end of this story? (that she could have a lot of fun with the invisible paint)

3 The words in the first column have endings. Write the same words without endings in the second column.

boarder	<u>board</u>
eaten	<u>eat</u>
washing	<u>wash</u>
flatter	<u>flat</u>
waved	<u>wave</u>

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Appendix E

Student Satisfaction Survey

Intervention Feedback

Remember, it is very important that you provide me (Carrie) with feedback about the program that you were tutored in. Your responses will help other schools make decisions about which programs to use at their school. DON'T be nice, be honest!

* Required

Tell me about you!

Enter your name below *

(First Name and Last Name)

Intervention? *

How would you describe your ethnic identity? *

- ☐ White
- ☐ Black
- ☐ Asian
- ☐ American Indian
- ☐ Latino
- ☐ Mixed ethnic heritage

What level of school did your MOM complete? *

- ☐ Less than 7th grade
- ☐ Junior high/middle school (9th grade)
- ☐ Part of high school (10th or 11th grade)
- ☐ High school graduate
- ☐ Partial college (at least 1 year)
- ☐ College degree
- ☐ Graduate degree
- ☐ Not Sure

What level of school did your DAD complete? *

- ☐ Less than 7th grade
- ☐ Junior high/middle school (9th grade)
- ☐ Part of high school (10th or 11th grade)
- ☐ High school graduate
- ☐ Partial college (at least 1 year)
- ☐ College degree
- ☐ Graduate degree
- ☐ Not sure

What is your mom's most recent job? *

What is your dad's most recent job? *

How much did you learn?

This program improved my spelling. *

	1	2	3	4	5	6	7	
Strongly Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly Agree

This program improved my ability to read new words. *

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

This program improved my ability to read out-loud in class. *

	1	2	3	4	5	6	7	
Strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Strongly agree

I would rate my EFFORT during tutoring as... *

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Didn't try hard ☐ ☐ ☐ ☐ ☐ ☐ ☐ LOTS of effort

I would rate my LEARNING in tutoring as.... *

1 2 3 4 5 6 7

Learned nothing ☐ ☐ ☐ ☐ ☐ ☐ ☐ Learned A LOT!

What are your feelings about the intervention?

I thought my intervention was boring. *

1 2 3 4 5 6 7

Strongly disagree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly agree

The other intervention looked like more fun. *

*NOT the intervention that you were tutored in.

1 2 3 4 5 6 7

Strongly disagree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly agree

I would recommend this program to a friend who is struggling with reading. *

1 2 3 4 5 6 7

Strongly disagree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly agree

This program made me feel more confident about my reading. *

1 2 3 4 5 6 7

Strongly disagree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly agree

I thought the lessons were too hard. *

1 2 3 4 5 6 7

Strongly disagree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly agree

I liked this intervention more than Voyager. *

1234567

Strongly disagreeStrongly agree

If I could chose a reading class, I would pick_____*

Select from the list below...

☐ Voyager

☐ Corrective Reading

☐ Sound Effects

Submit

Appendix F
Fidelity Checklists

Observer:	Date of Review:
Tutor:	Date of Instructional Session:
Lesson:	Evidence of Prior Practice: YES / NO

Sound Effects Fidelity Check

Lesson Components	Suggested Timing	Actual Time	Transition Time	Comments
a) Warm-up	2-3 minutes			
b) Part 1 – Rhyming	10 minutes		a to b ____	
c) Part 2 – Reading and Spelling	10 minutes		d to c ____	
d) Part 3 – Phrases and Sentences	5 minutes		c to d ____	
e) Game	15 minutes		d to e ____	

Rating Guide: 2 = Present and correct; 1 = Present, but needs improvement; 0 = Missing or incorrect

Sound Effects Critical Behaviors	Rating	Comments
• Tutor reminds student to say the rime card first and then read the whole word.	2 1 0	
• Tutor's pace is fast and consistent throughout lesson.	2 1 0	
• Tutor prompts the student with the vowel sound when the student is struggling.	2 1 0	
• Tutor ensures that both students read all words in parts 2 and 3 (spelling words are read before spelling them).	2 1 0	
• Tutor uses visual clues to cue students (e.g., "Red says A," look – how many letters are in between the vowels?).	2 1 0	
• Tutor awards points .	2 1 0	

1

Observer:	Date of Review:
Tutor:	Date of Instructional Session:
Lesson:	Evidence of Prior Practice: YES / NO

Corrective Reading Fidelity Check

Lesson Components	Suggested Timing	Actual Time	Transition Time	Comments
A) Word Attack Skills	10 minutes			
B) Group Reading	10-15 minutes		A to B_____	
C) Individual Reading Check-outs	10 minutes		B to C_____	
D) Workbook Exercises	10 minutes		C to D_____	

Rating Guide: 2 = Present and correct; 1 = Present, but needs improvement; 0 = Missing or incorrect

Corrective Critical Behaviors	Rating	Comments
• Tutor follows script in teacher's presentation book	2 1 0	
• Tutor's pace is fast and consistent throughout lesson	2 1 0	
• Tutor uses signal <i>immediately</i> after speaking to cue student	2 1 0	
• Tutor correctly follows correction procedure	2 1 0	
• Tutor's transition time between exercises is brief	2 1 0	
• Tutor correctly awards points	2 1 0	

Appendix G

Rime Card PowerPoint

Ready?

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